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A GUIDE TO THE EVALUATION OF PERMANENT IMPAIRMENT OF THE EXTREMITIES AND BACK

BY

THE COMMITTEE ON MEDICAL RATING OF PHYSICAL IMPAIRMENT

Special Edition

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THE Committee on Medical Rating of Physical Impairment is an ad hoc committee of the Board of Trustees appointed in September 1956 and authorized to establish guides for such rating. The first in a series of guides which the Committee expects to develop with the assistance of outstanding consultants was recently accepted by the Board of Trustees. This first guide deals with permanent impairment of the extremities and back and is presented in the following pages.

In reporting to the House of Delegates at the 1957 Annual Meeting in Philadelphia the Board of Trustees stated:

> "The Board believes that the Committee should be commended for its careful work on this difficult and complex subject, and calls to the attention of the House its intention to publish these guides in The Journal for the information of the profession."

The House of Delegates adopted the following report of the Reference Committee on Hygiene, Public Health and Industrial Health:

> "**Supplementary Report O—Medical Rating of Physical Impairment.** —Your reference committee has studied with care the 115-page "Guide to the Evaluation of Permanent Impairment of the Extremities and Back" by the Committee on Medical Rating of Physical Impairment presented with this supplementary report. Your reference committee wholeheartedly agrees with the Board that the Committee on Medical Rating of Physical Impairment has done a superb job on this difficult subject and looks forward with pleasure to the publication of such guides in The Journal of the A. M. A."

Members of the Committee on Medical Rating of Physical Impairment are Raymond M. McKeown, Chairman, Coos Bay, Oregon; George F. Gsell, Wichita, Kansas; Henry H. Kessler, Newark, New Jersey; Quentin W. Mack, Boise, Idaho; James R. McVay, Kansas City, Missouri; O. A. Sander, Milwaukee, Wisconsin; and Mr. George W. Cooley, Secretary, and Mrs. Marjorie W. Grigsby, Research Associate, Chicago.

The Committee is indebted to the following consultants for their able assistance in this phase of its work: Frank H. Krusen, Rochester, Minnesota; Earl D. McBride, Oklahoma City, Oklahoma; Carl O. Rice, Minneapolis, Minnesota; Chester C. Schneider, Milwaukee, Wisconsin; Earl C. Steele, Toronto, Ontario; and Julian H. Bigelow, Ph.D., Institute for Advanced Study, Princeton, New Jersey; Joseph E. Markee, Ph.D., Duke University School of Medicine, Durham, North Carolina; Mr. James J. Reid, South Carolina Industrial Commission, Columbia, South Carolina.

PREFACE

EVALUATION OR RATING of permanent disability has long been recognized as an important and complex subject. In the past much confusion has resulted from inadequate understanding by physicians and others of:

(a) The scope of *medical* responsibility in evaluation of permanent disability; and
(b) The *difference* between "permanent disability" and "permanent impairment."

It is vitally important for every physician to be aware of his proper role in the evaluation of permanent disability under any private or public program for the disabled. It is equally important for him to have the necessary authoritative material to assist him in competently fulfilling his particular responsibility—the evaluation of *permanent impairment*. It is the purpose of this and future reports by the Committee on Medical Rating of Physical Impairment to correct a past confusion of terms and to provide a series of practical guides to the evaluation of various types of *permanent impairments*.

The following explanations of generally-used terms in programs for the disabled will suffice for all practical purposes:

1. *Permanent Disability*. This is *not* a purely medical condition. A patient is "permanently disabled" or "under a permanent disability" when his actual *or* presumed ability to engage in gainful activity is reduced or absent because of "impairment" and no fundamental or marked change in the future can be expected.

2. *Permanent Impairment*. This *is* a purely medical condition. Permanent impairment is any anatomic or functional abnormality or loss after maximal *medical* rehabilitation has been achieved and which abnormality or loss the physician considers stable or non-progressive at the time evaluation is made. It is always a basic consideration in evaluation of permanent disability. It should be remembered, however, that *permanent impairment* is a contributing factor to, but *not* necessarily an indication of, the extent of a patient's *permanent disability*.

3. *Evaluation (Rating) of Permanent Disability*. This is an *administrative*, not medical, responsibility and function. Evaluation of permanent disability is an appraisal of the patient's present and probable future ability to engage in gainful activity as it is affected by non-medical factors such as age, sex, education, economic and social environment *and* the medical factor—permanent impairment. Non-medical factors have proved extremely difficult to measure. For this reason "permanent impairment" is in fact the sole or real criterion of "permanent disability" far more often than is readily acknowledged. Evaluation of permanent disability forms the basis for a *determination* of *permanent disability* which is an *administrative* decision as to the patient's entitlement.

4. *Evaluation (Rating) of Permanent Impairment*. This is a function which physicians alone are competent to perform. Evaluation of permanent impairment defines the scope of medical responsibility and therefore represents the physician's role in the evaluation of permanent disability. Evaluation of permanent impairment is an appraisal of the nature and extent of the patient's illness or injury as it affects his personal efficiency in the activities of daily living. These activities are self care, normal living postures, ambulation, elevation, traveling, and non-specialized hand activities. It is not and never can be the duty of physicians to evaluate the social and economic effects of permanent impairment. These effects must be evaluated by administrators in making determinations of permanent disability.

Competent evaluation of permanent impairment requires adequate and complete medical examination, accurate objective measurement of function, and avoidance of subjective impressions and non-medical factors such as the patient's age, sex, or employability.

The Committee on Medical Rating of Physical Impairment believes that permanent impairment cannot vary because of the circumstances of its occurrence or the geographic location of the patient at the time. Furthermore, unlike disability, permanent impairment can be measured with a reasonable degree of accuracy and uniformity on the basis of impaired function as evidenced by loss of structural integrity, pathology, or pain substantiated by clinical findings.

The Committee is familiar with the various formulae developed in the past for use in evaluation of *permanent disability*. These formulae are usually administrative devices which equate specific medical criteria to specific percentages of permanent partial or total disability (loss of working or earning capacity). From the medical standpoint the medical criteria may undeniably represent various anatomic

or functional *impairments*. However, it is unrealistic to presume that many of these impairments, especially those of a minor nature, will necessarily at some time result in *disability*. These administrative devices are not generally available to physicians and in any event would not be useful in making sound evaluations of permanent impairment.

On the other hand, although a number of valuable contributions have been made in the past, the Committee found no comprehensive practical system of the type necessary for the evaluation of permanent impairment by individual body systems or of the whole man. For this reason the Committee has undertaken to prepare a series of guides, the first of which deals with permanent impairment of the extremities and the back and is introduced below.

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INTRODUCTION

THIS GUIDE has been developed after careful study of the literature and views of recognized medical authorities as well as consultation with those of allied disciplines. Periodic review will be necessary to assure the guide's continuing value as advances in medical knowledge and technique occur.

This particular guide is arranged in three sections dealing with: (1) the upper extremity; (2) the lower extremity; and (3) the back. Each section contains material on:

1. Technic of measurement;
2. Tables of relative impairment due to restriction of motion, ankylosis, amputations, fractures, and other conditions; and
3. Methods for combining and relating various impairments.

As one becomes acquainted with this material, its simplicity and uniformity of application becomes readily apparent.

For the purposes of this guide:

The *upper extremity* is a unit of the whole man. It may be divided into four sections: the hand, wrist, elbow, and shoulder. The hand has five digits: the thumb, index, middle, ring, and little fingers. The thumb has two joints: interphalangeal and metacarpophalangeal. Each finger has three joints: distal interphalangeal, proximal interphalangeal, and metacarpophalangeal.

The *lower extremity* is a unit of the whole man. It may be divided into four sections: the foot, ankle, knee, and hip. The foot has five digits: the great toe, second, third, fourth, and fifth toes. The great toe has two joints: interphalangeal and metatarsophalangeal. Each of the second through fifth toes has three joints: distal interphalangeal, proximal interphalangeal, and metatarsophalangeal.

The *back* is a unit of the whole man. It may be divided into three sections: the cervical, dorsal, and lumbar regions. The cervical region has seven vertebrae (C1-C7). The dorsal region has twelve vertebrae (D1-D12). The lumbar region has five vertebrae (L1-L5). For the purpose of measuring restricted motion, the back is divided into two sections: the cervical region and the dorsolumbar region.

Technic of measurement are simple, practical, and scientifically sound. A large and a small portable goniometer are the only medical devices necessary. Suggested types of these devices for measuring angles of fixation and ranges of motion of joints are illustrated in the text. Testing procedures for restriction of motion and ankylosis are uniform, described in detail, and illustrated. Whenever possible, the contralateral normal joint should serve as the standard against which the impaired joint is measured.

Two measurements are necessary to determine restriction of motion. The first measurement is taken with the patient in the prescribed neutral position for each motion. The second measurement is taken after the patient has carried out the motion as far as possible. The range of motion may be limited at either its beginning or its conclusion. For instance, a contracture may prevent a patient from reaching the prescribed neutral position, in which case the first measurement is subtracted from the second to give the true range of motion. In some tests, e.g. shoulder elevation, motion at more than one joint is tested simultaneously. Therefore, maximal active motion of the joint tested should be achieved, even if other joints are moved secondarily. This does not include motion of the trunk when testing motion of the extremities. However, motion at the hip joint is also measured when testing for flexion–extension of the dorsolumbar region.

In measuring ankylosis, deviation from the prescribed neutral position is measured.

Additional or less objective testing procedures may be considered desirable in specific cases. However, in most instances, the technic of measurement provided may be considered adequate. There can be no question as to their superiority over the all too prevalent practice of "measuring" without the aid of any measuring device or uniform procedure. Measurements derived from testing procedures are easily transposed to relative impairment by reference to adjoining tables.

Tables of relative impairment reflecting equitable values for impairment of function are essential to

accurate, uniform evaluation of permanent impairment. In developing the tables of relative impairments in this guide, ranges of motion to be measured and certain basic values were scientifically established on the basis of:

1. Analysis of anatomic and physiological factors underlying *function;* and
2. Lengthy and comprehensive professional experience with and observation of the *functional* value of:
   a. Each range of motion to total range of motion;
   b. The various angles of fixation in ankylosis;
   c. The extremities and back to the whole man;
   d. The various spinal regions to the back;
   e. The hand, wrist, elbow, and shoulder to the upper extremity;
   f. The foot, ankle, knee, and hip to the lower extremity;
   g. The digits to the hand or foot;
   h. The joints to the digits.

Methods of combining and relating various impairments are uniform, explained in detail and examples, and require a minimum of computation.

In general the method employed to *relate* impairments is to give the percentage relationship of the smaller part to the next larger part in the appropriate impairment table for the smaller part. This process may be repeated successively so that any impairment may be expressed in terms of impairment of the whole man.

The method generally employed to *combine* various impairments is based on the principle that each impairment acts, not on the whole part, but on the portion which remains after the preceding impairment has acted. When there is more than one impairment to a given part, these impairments must be *combined before* the conversion to a larger part is made. A combined values table has been provided by which any combination of impairments may be easily found.

The final impairment value is to be expressed in terms of the nearest five percent after all impairments have been computed and transposed to a common denominator.

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AMPUTATIONS

	IMPAIRMENT OF			
	Digit	Hand	Upper Extremity	Whole Man
Forequarter amputation				70%
Disarticulation at shoulder joint			100%	60%
Amputation of arm above deltoid insertion			100%	60%
Amputation of arm between deltoid insertion and elbow joint			95%	57%
Disarticulation at elbow joint			95%	57%
Amputation of forearm below elbow joint proximal to insertion of biceps tendon			95%	57%
Amputation of forearm below elbow joint distal to insertion of biceps tendon		100%	90%	
Disarticulation at wrist joint		100%	90%	
Midcarpal or mid-metacarpal amputation of hand		100%	90%	
Amputation of all fingers except thumb at metacarpophalangeal joints		60%	54%	
Amputation of *Thumb*				
At metacarpophalangeal joint or with resection of carpo-metacarpal bone	100%	40%		
At interphalangeal joint	75%	30%		
Amputation of *Index Finger*				
At metacarpophalangeal joint or with resection of metacarpal bone	100%	25%		
At proximal interphalangeal joint	80%	20%		
At distal interphalangeal joint	45%	11%		
Amputation of *Middle Finger*				
At metacarpophalangeal joint or with resection of metacarpal bone	100%	20%		
At proximal interphalangeal joint	80%	16%		
At distal interphalangeal joint	45%	9%		
Amputation of *Ring Finger*				
At metacarpophalangeal joint or with resection of metacarpal bone	100%	10%		
At proximal interphalangeal joint	80%	8%		
At distal interphalangeal joint	45%	5%		
Amputation of *Little Finger*				
At metacarpophalangeal joint or with resection of metacarpal bone	100%	5%		
At proximal interphalangeal joint	80%	4%		
At distal interphalangeal joint	45%	2%		

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MULTIPLE DIGITS

All Joints	Amputated	IMPAIRMENT OF HAND		
		Ankylosed in		
		Full Extension	Position of Function	Full Flexion
Thumb	40%	30%	23%	40%
Thumb Index	65%	53%	43%	65%
Thumb Index Middle	85%	71%	59%	85%
Thumb Index Ring	75%	62%	51%	75%
Thumb Index Little	70%	58%	47%	70%
Thumb Index Middle Ring	95%	80%	67%	95%
Thumb Index Middle Little	90%	76%	63%	90%
Thumb Index Ring Little	80%	67%	55%	80%
Thumb Index Middle Ring Little	100%	85%	71%	100%
Thumb Middle	60%	48%	39%	60%
Thumb Middle Ring	70%	57%	47%	70%
Thumb Middle Little	65%	53%	43%	65%
Thumb Middle Ring Little	75%	62%	51%	75%
Thumb Ring	50%	39%	31%	50%
Thumb Ring Little	55%	44%	35%	55%
Thumb Little	45%	35%	27%	45%
Index	25%	23%	20%	25%
Index Middle	45%	41%	36%	45%
Index Middle Ring	55%	50%	44%	55%
Index Middle Little	50%	46%	40%	50%
Index Middle Ring Little	60%	55%	48%	60%
Index Ring	35%	32%	28%	35%
Index Ring Little	40%	37%	32%	40%
Index Little	30%	28%	24%	30%
Middle	20%	18%	16%	20%
Middle Ring	30%	27%	24%	30%
Middle Ring Little	35%	32%	28%	35%
Middle Little	25%	23%	20%	25%
Ring	10%	9%	8%	10%
Ring Little	15%	14%	12%	15%
Little	5%	5%	4%	5%

INTERPHALANGEAL JOINT of THUMB

TECHNIC OF MEASUREMENT: Flexion-Extension

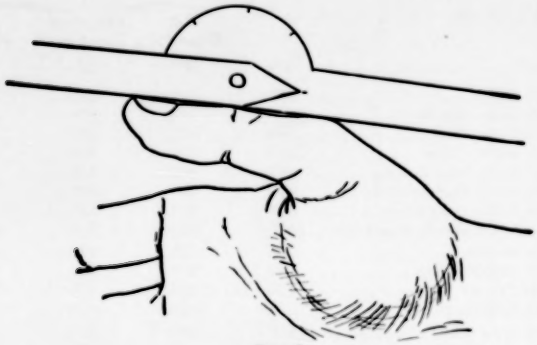


Fig. 1

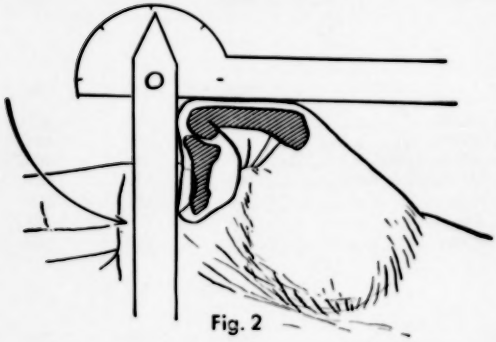


Fig. 2

Restricted Motion

1. Place patient's hand in neutral position as shown in fig. 1.
2. Center goniometer over dorsum of interphalangeal joint as shown in fig. 2. Record goniometer reading.
3. With patient flexing interphalangeal joint as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of thumb.

Example: 40 degrees active flexion from neutral position (0°) OR from maximum extension = 2% impairment of thumb.

Ankylosis

1. Place goniometer base as if measuring neutral position show above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of thumb.

Example: Interphalangeal joint ankylosed at 40 degrees flexion = 35% impairment of thumb.

INTERPHALANGEAL JOINT of THUMB

	IMPAIRMENT of THUMB
AMPUTATION—At Joint	75%

RESTRICTED MOTION TABLE

Average range of FLEXION–EXTENSION = 80 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion LOST	RETAINED	
Flexion from neutral position (0°) to: 0°	80	0	45%
10°	70	10	39
20°	60	20	34
30°	50	30	28
40°	40	40	23
50°	30	50	17
60°	20	60	11
70°	10	70	6
80°	0	80	0

ANKYLOSIS TABLE

Joint ankylosed at: 0° (neutral position)	45%
10°	43
20°	40
30°	38
*40°	35
50°	45
60°	55
70°	65
80° (full flexion)	75

*position of function

METACARPOPHALANGEAL JOINT of THUMB

TECHNIC OF MEASUREMENT: Flexion-Extension

Fig. 1

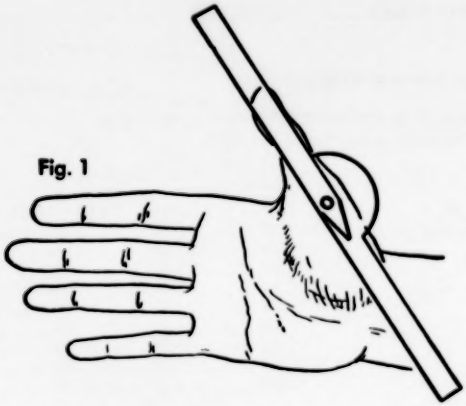
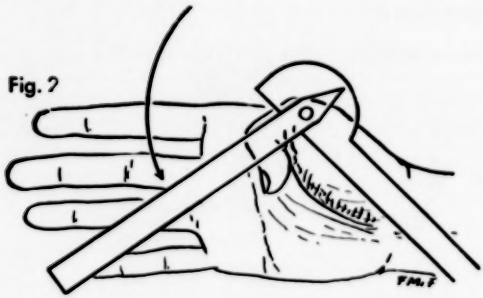


Fig. 2



Restricted Motion

1. Place patient's hand in neutral position as shown in fig. 1.

2. Center goniometer adjacent to metacarpophalangeal joint as shown in fig. 1. Record goniometer reading.

3. With patient flexing metacarpophalangeal joint as far as possible, as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of thumb.

Example: 50 degrees active flexion from neutral position (0°) OR from maximum extension = 9% impairment of thumb.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of thumb.

Example: Metacarpophalangeal joint ankylosed at 50 degrees flexion = 35% impairment of thumb.

METACARPOPHALANGEAL JOINT of THUMB

	IMPAIRMENT of THUMB
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FLEXION—EXTENSION = 60 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion		
	LOST	RETAINED	
Flexion from neutral position (0°) to: 0°	60	0	55%
10°	50	10	46
20°	40	20	37
30°	30	30	27
40°	20	40	18
50°	10	50	9
60°	0	60	0

ANKYLOSIS TABLE

Joint ankylosed at:	0° (neutral position)	55%
	10°	51
	20°	47
	30°	43
	40°	39
	*50°	35
	60° (full flexion)	100

*position of function

THUMB

When BOTH JOINTS are Involved

1. CALCULATE *separately* and record impairment of thumb contributed by EACH joint.

2. COMBINE impairment values, using combined values table, to ascertain impairment of thumb contributed by BOTH joints.

	IMPAIRMENT of THUMB
Example—Ankylosis	
Interphalangeal joint: ankylosed at 40 degrees flexion.. =	35%
Metacarpophalangeal joint: ankylosed at 50 degrees flexion ---------- =	35
(35 *combined* with 35 = 58)	58%
Example—Ankylosis and Restricted Motion	
Interphalangeal joint: ankylosed at 40 degrees flexion.. =	35%
Metacarpophalangeal joint: 50 degrees active flexion from neutral position (0°) OR from maximum extension =	9
(35 *combined* with 9 = 41)	41%
Example—Restricted Motion	
Interphalangeal joint: 40 degrees active flexion from neutral position (0°) OR from maximum extension.... =	23%
Metacarpophalangeal joint: 50 degrees active flexion from neutral position (0°) OR from maximum extension =	9
(23 *combined* with 9 = 30)	30%
Example—Amputation and Restricted Motion	
Interphalangeal joint: amputated ---------- =	75%
Metacarpophalangeal joint: 50 degrees active flexion from neutral position (0°) OR from maximum extension =	9
(75 *combined* with 9 = 77)	77%

3. CONSULT following table to ascertain impairment of HAND contributed by THUMB.

THUMB

IMPAIRMENT OF Thumb	Hand
0% – 1%	= 0%
2% – 3%	= 1%
4% – 6%	= 2%
7% – 8%	= 3%
9% – 11%	= 4%
12% – 13%	= 5%
14% – 16%	= 6%
17% – 18%	= 7%
19% – 21%	= 8%
22% – 23%	= 9%
24% – 26%	= 10%
27% – 28%	= 11%
29% – 31%	= 12%
32% – 33%	= 13%
34% – 36%	= 14%
37% – 38%	= 15%
39% – 41%	= 16%
42% – 43%	= 17%
44% – 46%	= 18%
47% – 48%	= 19%
49% – 51%	= 20%
52% – 53%	= 21%
54% – 56%	= 22%
57% – 58%	= 23%
59% – 61%	= 24%
62% – 63%	= 25%
64% – 66%	= 26%
67% – 68%	= 27%
69% – 71%	= 28%
72% – 73%	= 29%
74% – 76%	= 30%
77% – 78%	= 31%
79% – 81%	= 32%
82% – 83%	= 33%
84% – 86%	= 34%
87% – 88%	= 35%
89% – 91%	= 36%
92% – 93%	= 37%
94% – 95%	= 38%
97% – 98%	= 39%
99% – 100%	= 40%

NOTE: Impairment of HAND contributed by THUMB may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

DISTAL INTERPHALANGEAL JOINT of ANY FINGER

TECHNIC OF MEASUREMENT: Flexion-Extension

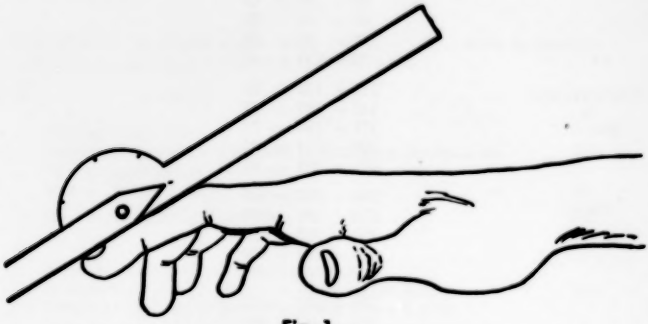


Fig. 1

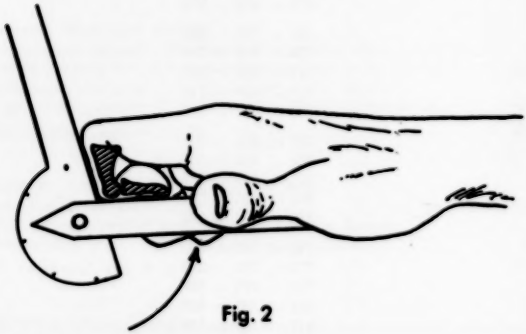


Fig. 2

Restricted Motion

1. Place patient's hand in neutral position as shown in fig. 1.

2. Center goniometer over dorsum of distal interphalangeal joint as shown in fig. 1. Record goniometer reading.

3. With patient flexing distal interphalangeal joint as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of finger.

Example: 40 degrees active flexion from neutral position (0°) OR from maximum extension = 19% impairment of finger.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of finger.

Example: Distal interphalangeal joint ankylosed at 40 degrees = 30% impairment of finger.

DISTAL INTERPHALANGEAL JOINT of ANY FINGER

	IMPAIRMENT of FINGER
AMPUTATION—At Joint	45%

RESTRICTED MOTION TABLE

Average range of FLEXION—EXTENSION = 70 degrees
Value to total range of joint motion = 100%

Flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	70	0	45%
10°	60	10	38
20°	50	20	32
30°	40	30	26
40°	30	40	19
50°	20	50	13
60°	10	60	6
70°	0	70	0

ANKYLOSIS TABLE

Joint ankylosed at:	
0° (neutral position)	45%
10°	41
20°	38
30°	34
*40°	30
50°	35
60°	40
70° (full flexion)	45

*position of function

PROXIMAL INTERPHALANGEAL JOINT of ANY FINGER

TECHNIC OF MEASUREMENT: Flexion-Extension

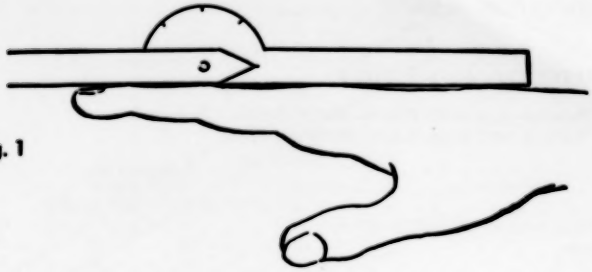


Fig. 1

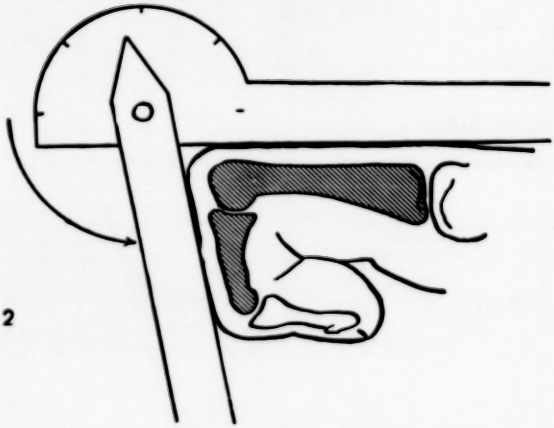


Fig. 2

Restricted Motion

1. Place patient's hand in neutral position as shown in fig. 1.

2. Center goniometer over dorsum of proximal interphalangeal joint as shown in fig. 1. Record goniometer reading.

3. With patient flexing proximal interphalangeal joint as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of finger.

Example: 40 degrees active flexion from neutral position (0°) OR from maximum extension = 36% impairment of finger.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from the neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of finger.

Example: Proximal interphalangeal joint ankylosed at 40 degrees flexion = 50% impairment of finger.

PROXIMAL INTERPHALANGEAL JOINT of ANY FINGER

	IMPAIRMENT of FINGER
AMPUTATION—At Joint	80%

RESTRICTED MOTION TABLE

Average range of FLEXION–EXTENSION = 100 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion		
	LOST	RETAINED	
Flexion from neutral position (0°) to: 0°	100	0	60%
10°	90	10	54
20°	80	20	48
30°	70	30	42
40°	60	40	36
50°	50	50	30
60°	40	60	24
70°	30	70	18
80°	20	80	12
90°	10	90	6
100°	0	100	0

ANKYLOSIS TABLE

Joint ankylosed at: 0° (neutral position)	60%
10°	58
20°	55
30°	53
*40°	50
50°	55
60°	60
70°	65
80°	70
90°	75
100° (full flexion)	80

*position of function

METACARPOPHALANGEAL JOINT of ANY FINGER

TECHNIC OF MEASUREMENT: Flexion-Extension

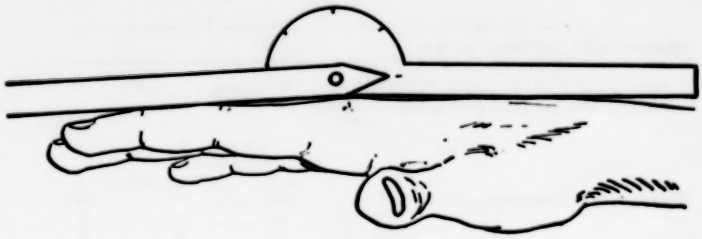


Fig. 1

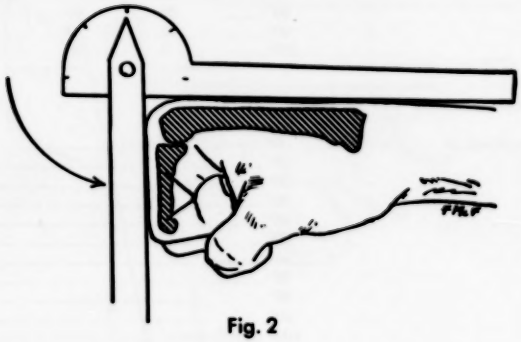


Fig. 2

Restricted Motion

1. Place patient's hand in neutral position as shown in fig. 1.
2. Center goniometer over dorsum of metacarpophalangeal joint as shown in fig. 1. Record goniometer reading.
3. With patient attempting to make a fist as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of finger.

Example: 30 degrees active flexion from neutral position (0°) OR from maximum extension = 37% impairment of finger.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of finger.

Example: Metacarpophalangeal joint ankylosed at 30 degrees flexion = 45% impairment of finger.

METACARPOPHALANGEAL JOINT of ANY FINGER

	IMPAIRMENT of FINGER
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FLEXION–EXTENSION = 90 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion LOST	RETAINED	
Flexion from neutral position (0°) to: 0°	90	0	55%
10°	80	10	49
20°	70	20	43
30°	60	30	37
40°	50	40	31
50°	40	50	24
60°	30	60	18
70°	20	70	12
80°	10	80	6
90°	0	90	0

ANKYLOSIS TABLE

Joint ankylosed at: 0° (neutral position)	55%
10°	52
20°	48
*30°	45
40°	54
50°	63
60°	72
70°	82
80°	91
90° (full flexion)	100

*position of function

ANY FINGER

When TWO or MORE JOINTS are Involved

1. **CALCULATE *separately* and record impairment of finger contributed by EACH joint.**

2. **COMBINE impairment values, using combined values table, to ascertain impairment of finger contributed by TWO or MORE joints.**

	IMPAIRMENT of FINGER
Example–Two Joints	
Distal interphalangeal joint: ankylosed at 40 degrees--- =	30%
Proximal interphalangeal joint: ankylosed at 40 degrees =	50
(30 *combined* with 50 = 65)	65%
Example–Three Joints	
Distal interphalangeal joint: amputated---------- =	45%
Proximal interphalangeal joint: ankylosed at 40 degrees =	50
Metacarpophalangeal joint: 30 degrees active flexion from neutral position (0°) OR from maximum extension =	37
(45 *combined* with 50 = 73; 73 *combined* with 37 = 83)	83%

3. **CONSULT following table for appropriate finger to ascertain impairment of HAND contributed by FINGER.**

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FINGERS

IMPAIRMENT OF Index Finger	HAND
0% – 1%	0%
2% – 5%	1%
6% – 9%	2%
10% – 13%	3%
14% – 17%	4%
18% – 21%	5%
22% – 25%	6%
26% – 29%	7%
30% – 33%	8%
34% – 37%	9%
38% – 41%	10%
42% – 45%	11%
46% – 49%	12%
50% – 53%	13%
54% – 57%	14%
58% – 61%	15%
62% – 65%	16%
66% – 69%	17%
70% – 73%	18%
74% – 77%	19%
78% – 81%	20%
82% – 85%	21%
86% – 89%	22%
90% – 93%	23%
94% – 97%	24%
98% – 100%	25%

IMPAIRMENT OF Middle Finger	HAND
0% – 2%	0%
3% – 7%	1%
8% – 12%	2%
13% – 17%	3%
18% – 22%	4%
23% – 27%	5%
28% – 32%	6%
33% – 37%	7%
38% – 42%	8%
43% – 47%	9%
48% – 52%	10%
53% – 57%	11%
58% – 62%	12%
63% – 67%	13%
68% – 72%	14%
73% – 77%	15%
78% – 82%	16%
83% – 87%	17%
88% – 92%	18%
93% – 97%	19%
98% – 100%	20%

Little Finger

0% – 9%	0%
10% – 29%	1%
30% – 49%	2%
50% – 69%	3%
70% – 89%	4%
90% – 100%	5%

Ring Finger

0% – 4%	0%
5% – 14%	1%
15% – 24%	2%
25% – 34%	3%
35% – 44%	4%
45% – 54%	5%
55% – 64%	6%
65% – 74%	7%
75% – 84%	8%
85% – 94%	9%
95% – 100%	10%

NOTE: Impairment of HAND contributed by FINGER may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

HAND

When TWO or MORE DIGITS are Involved

1. CALCULATE *separately* and record impairment of EACH digit involved.

2. CALCULATE *separately* and record impairment of hand as contributed by EACH digit involved.

3. ADD all impairment of hand values. The sum of these values is impairment of the hand.

Example		IMPAIRMENT of HAND
10% of Thumb	=	4%
20% of Index finger	=	5
30% of Middle finger	=	6
40% of Ring finger	=	4
50% of Little finger	=	3
(4 + 5 + 6 + 4 + 3 = 22)		22%

4. CONSULT following table to ascertain impairment of UPPER EXTREMITY as contributed by HAND.

HAND

IMPAIRMENT OF Hand	=	IMPAIRMENT OF UPPER EXTREMITY
0%	=	0%
1%	=	1%
2%	=	2%
3%	=	3%
4%	=	4%
5%	=	5%
6%	=	5%
7%	=	6%
8%	=	7%
9%	=	8%
10%	=	9%
11%	=	10%
12%	=	11%
13%	=	12%
14%	=	13%
15%	=	14%
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90%	=	81%
91%	=	82%
92%	=	83%
93%	=	84%
94%	=	85%
95%	=	86%
96%	=	86%
97%	=	87%
98%	=	88%
99%	=	89%
100%	=	90%

NOTE: Impairment of UPPER EXTREMITY contributed by HAND may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

WRIST JOINT

TECHNIC OF MEASUREMENT: Dorsi-flexion

Fig. 1

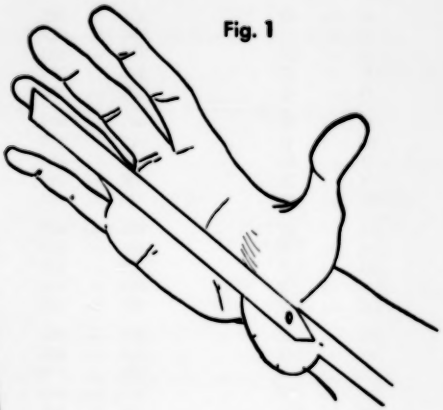
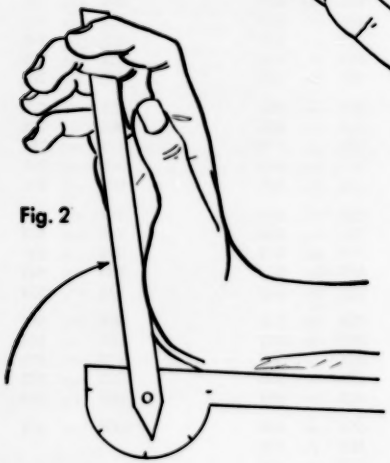


Fig. 2



Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note pronation of forearm.

2. Center goniometer beneath patient's wrist as shown in fig. 1. Record reading with goniometer arm between patient's middle and ring fingers.

3. With the patient dorsi-flexing wrist as far as possible as shown in fig 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 30 degrees active dorsi-flexion from neutral position (0°) OR any 30 degree arc of retained active dorsi-flexion = 5% impairment of upper extremity.

5. ADD upper extremity impairment values contributed by dorsi-flexion and palmar-flexion. The sum of these values is impairment of upper extremity contributed by dorsi-palmar flexion of wrist.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Wrist joint ankylosed at 30 degrees dorsi-flexion = 25% impairment of upper extremity.

WRIST JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	90%

RESTRICTED MOTION TABLE

Average range of DORSI-PALMAR FLEXION = 130 degrees
Value to total range of joint motion = 70%

Dorsi-flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	60	0	10%
10°	50	10	8
20°	40	20	6
30°	30	30	5
40°	20	40	3
50°	10	50	2
60°	0	60	0

ANKYLOSIS TABLE

Joint ankylosed at:		
0° (neutral position)		30%
10°		28
20°		27
*30°		25
40°		47
50°		68
60° (full dorsi-flexion)		90

*position of function

WRIST JOINT

TECHNIC OF MEASUREMENT: Palmar-Flexion

Fig. 1

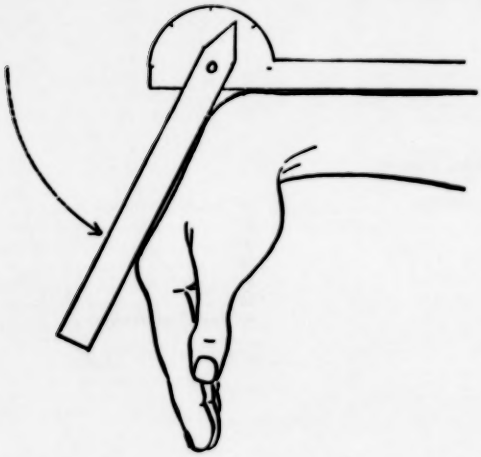


Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note pronation of the forearm.
2. Center goniometer on patient's wrist as shown in fig. 1. Record goniometer reading.
3. With patient palmar-flexing wrist as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

   Example: 30 degrees active palmar-flexion from neutral position (0°) OR any 30 degree arc of retained active palmar-flexion = 6% impairment of upper extremity.
5. ADD upper extremity impairment values contributed by dorsi-flexion and palmar-flexion. The sum of these values is impairment of the upper extremity contributed by dorsi-palmar flexion of wrist.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of upper extremity.

   Example: Wrist joint ankylosed at 30 degrees palmar-flexion = 56% impairment of upper extremity.

WRIST JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	90%

RESTRICTED MOTION TABLE

Average range of DORSI-PALMAR FLEXION = 130 degrees
Value to total range of joint motion = 70%

Palmar-flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	70	0	11%
10°	60	10	10
20°	50	20	8
30°	40	30	6
40°	30	40	5
50°	20	50	3
60°	10	60	2
70°	0	70	0

ANKYLOSIS TABLE

Joint ankylosed at:		
0° (neutral position)	30%
10°	39
20°	47
30°	56
40°	64
50°	73
60°	81
70° (full palmar-flexion)	90

WRIST JOINT

TECHNIC OF MEASUREMENT: Radial-Ulnar Deviation

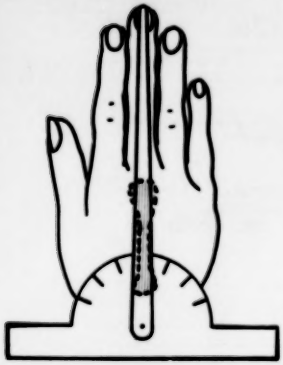


Fig. 1

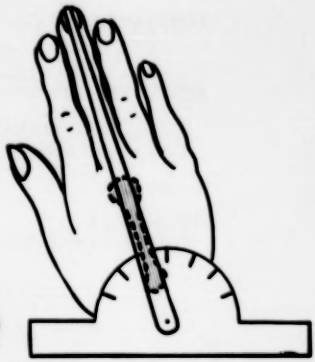


Fig. 2

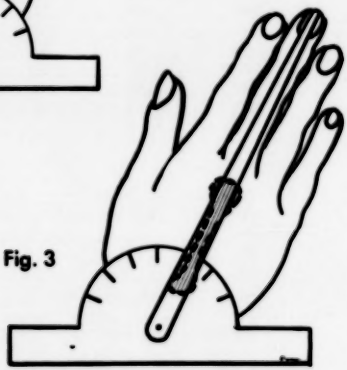


Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note pronation of hand and forearm.

2. Center goniometer over wrist with its arm lying directly over third metacarpal bone as shown in fig. 1. Record goniometer reading.

3. *Radial deviation:* Starting from neutral position with patient radial deviating wrist as far as possible as shown in fig. 2, follow range of motion with goniometer arm over third metacarpal bone. Record end of arc of motion.

4. *Ulnar deviation:* With patient ulnar deviating wrist as far as possible as shown in fig. 3, follow range of motion with goniometer arm over third metacarpal bone. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 10 degrees active radial deviation from neutral position (0°) OR any 10 degree arc of retained active radial deviation = 2% impairment of upper extremity.

6. ADD upper extremity impairment values contributed by radial and ulnar deviation. The sum of these values is impairment of upper extremity contributed by radial deviation and ulnar deviation of wrist.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Wrist joint ankylosed at 20 degrees ulnar deviation = 70% impairment of upper extremity.

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WRIST JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	90%

RESTRICTED MOTION TABLE

Average range of RADIAL-ULNAR DEVIATION = 50 degrees
Value to total range of joint motion = 30%

	Degrees of Joint Motion		
	LOST	RETAINED	
Radial deviation from neutral position (0°) to:			
0°	20	0	4%
10°	10	10	2
20°	0	20	0
Ulnar deviation from neutral position (0°) to:			
0°	30	0	5%
10°	20	10	4
20°	10	20	2
30°	0	30	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	30%
	10°	60
	20° (full radial deviation)	90
Joint ankylosed at:	*0° (neutral position)	30%
	10°	50
	20°	70
	30° (full ulnar deviation)	90

*position of function

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WRIST JOINT

When TWO RANGES of MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of upper extremity contributed by EACH range of motion.

2. ADD impairment of upper extremity values contributed by ALL ranges of motion. The sum of these values is impairment of upper extremity contributed by WRIST joint.

Example		IMPAIRMENT of UPPER EXTREMITY
20 degrees active DORSI-FLEXION	=	6%
20 degrees active PALMAR-FLEXION	=	8
10 degrees active RADIAL DEVIATION	=	2
10 degrees active ULNAR DEVIATION	=	4
(6 + 8 + 2 + 4 = 20)		20%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of upper extremity contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment value is the impairment of the upper extremity contributed by WRIST joint.

Example		IMPAIRMENT of UPPER EXTREMITY
Wrist joint ankylosed at:		
30 degrees DORSI-FLEXION	=	25%
10 degrees RADIAL DEVIATION	=	60

The largest ankylosis impairment value is 60%, therefore, upper extremity is 60% impaired by ankylosed wrist joint.

ELBOW JOINT

TECHNIC OF MEASUREMENT: Flexion-Extension

Fig. 1

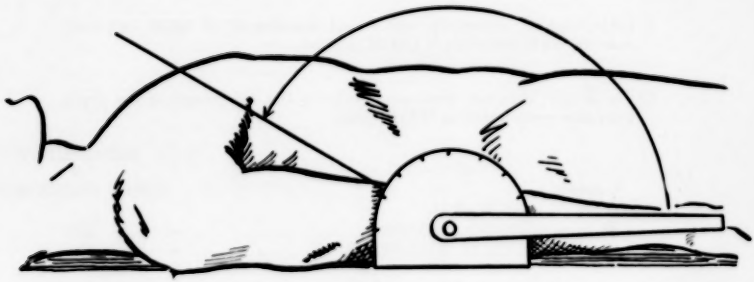

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note supination of forearm.

2. Center goniometer next to elbow joint as shown in fig. 2. Record goniometer reading with goniometer arm along axis of forearm.

3. With patient flexing arm as shown in fig. 1, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 100 degrees active flexion from neutral position (0°) OR any 100 degree arc of retained active flexion = 13% impairment of upper extremity.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Elbow joint ankylosed at 100 degrees flexion = 50% impairment of upper extremity.

ELBOW JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	95%

RESTRICTED MOTION TABLE

Average range of FLEXION—EXTENSION = 150 degrees
Value to total range of joint motion = 60%

Flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	150	0	39%
10°	140	10	36
20°	130	20	34
30°	120	30	31
40°	110	40	29
50°	100	50	26
60°	90	60	23
70°	80	70	21
80°	70	80	18
90°	60	90	16
100°	50	100	13
110°	40	110	10
120°	30	120	8
130°	20	130	5
140°	10	140	3
150°	0	150	0

ANKYLOSIS TABLE

Joint ankylosed at:	
0° (neutral position)	65%
10°	64
20°	62
30°	61
40°	59
50°	58
60°	56
70°	55
80°	53
90°	52
*100°	50
110°	59
120°	68
130°	77
140°	86
150° (full flexion)	95

*position of function

ELBOW JOINT

TECHNIC OF MEASUREMENT: Rotation

Fig. 1

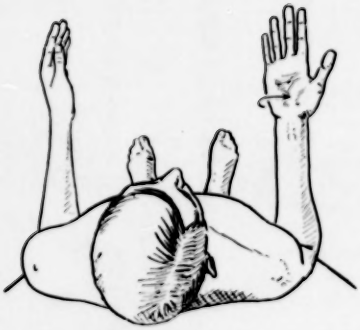

Fig. 2

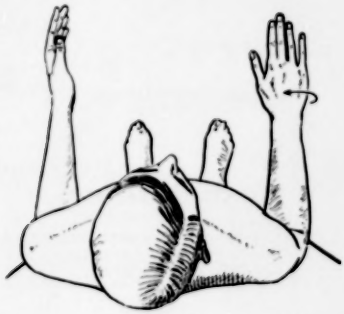

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note mid-position of forearm. The goniometer is not used in this measurement.

2. *Supination:* With patient supinating forearm as indicated in fig. 2, record range of motion as estimated by arc described by plane of hand as it turns.

3. *Pronation:* With patient pronating his forearm as indicated in fig. 3, record range of motion as estimated by arc described by plane of hand as it turns.

4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 20 degrees active pronation from neutral position (0°) OR any 20 degree arc of retained active pronation = 10% impairment of upper extremity.

5. ADD upper extremity impairment values contributed by pronation and supination. The sum of these values is impairment of upper extremity, contributed by rotation of elbow.

Ankylosis

1. Estimate angle at which joint is ankylosed by angle of plane of hand.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Elbow joint ankylosed at mid-rotation (0°) = 65% impairment of upper extremity.

ELBOW JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	95%

RESTRICTED MOTION TABLE

Average range of ROTATION = 160 degrees
Value to total range of joint motion = 40%

	Degrees of Joint Motion LOST	RETAINED	
Pronation from neutral position (0°) to:			
0°	80	0	13%
10°	70	10	11
20°	60	20	10
30°	50	30	8
40°	40	40	7
50°	30	50	5
60°	20	60	3
70°	10	70	2
80°	0	80	0
Supination from neutral position (0°) to:			
0°	80	0	13%
10°	70	10	11
20°	60	20	10
30°	50	30	8
40°	40	40	7
50°	30	50	5
60°	20	60	3
70°	10	70	2
80°	0	80	0

ELBOW JOINT

ANKYLOSIS TABLE

		IMPAIRMENT of UPPER EXTREMITY
Joint ankylosed at:	*0° (neutral position)	65%
	10°	69
	20°	73
	30°	76
	40°	80
	50°	84
	60°	88
	70°	91
	80° (full pronation)	95
Joint ankylosed at:	*0° (neutral position)	65%
	10°	69
	20°	73
	30°	76
	40°	80
	50°	84
	60°	88
	70°	91
	80° (full supination)	95

*position of function

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ELBOW JOINT

When TWO RANGES of MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of upper extremity contributed by EACH range of motion.

2. ADD impairment of upper extremity values contributed by ALL ranges of motion. The sum of these values is impairment of upper extremity contributed by ELBOW joint.

Example		IMPAIRMENT of UPPER EXTREMITY
20 degrees active PRONATION	=	10%
20 degrees active SUPINATION	=	10
100 degrees active FLEXION	=	13
(10 + 10 + 13 = 33)		33%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of upper extremity contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment value is impairment of upper extremity contributed by ELBOW joint.

Example		IMPAIRMENT of UPPER EXTREMITY
Elbow joint ankylosed at:		
100 degrees FLEXION	=	50%
20 degrees PRONATION	=	73

The largest ankylosis impairment value is 73%, therefore, upper extremity is 73% impaired by ankylosed elbow joint.

SHOULDER JOINT

TECHNIC OF MEASUREMENT: Forward Elevation

Fig. 1

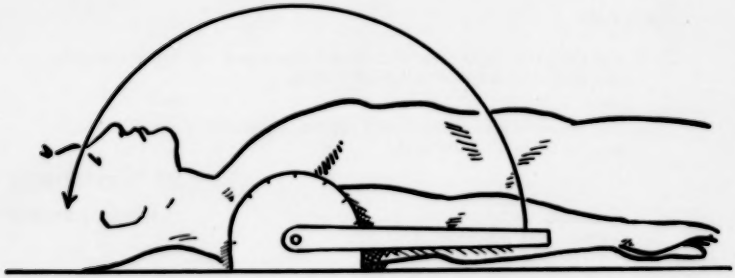

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note pronation of forearm.
2. Center goniometer next to shoulder joint as shown in fig. 2. Record goniometer reading with goniometer arm along axis of upper arm.
3. With patient elevating *both* arms as far as possible as shown in fig. 1, follow range of motion with goniometer arm. Record end of arc of motion in arm to be tested.
4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 30 degrees active forward elevation from neutral position (0°) OR any 30 degree arc of retained active forward elevation = 13% impairment of upper extremity.

5. ADD upper extremity impairment values contributed by forward elevation and backward elevation. The sum of these values is impairment of upper extremity contributed by forward-backward elevation of shoulder.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Shoulder joint ankylosed at 30 degrees forward elevation = 40% impairment of upper extremity.

SHOULDER JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FORWARD—BACKWARD ELEVATION = 190 degrees
Value to total range of joint motion = 33%

	Degrees of Joint Motion LOST	RETAINED	
Forward elevation from neutral position (0°) to:	0°	150	0 16%
	10°	140	10 15
	20°	130	20 14
	30°	120	30 13
	40°	110	40 12
	50°	100	50 11
	60°	90	60 9
	70°	80	70 8
	80°	70	80 7
	90°	60	90 6
	100°	50	100 5
	110°	40	110 4
	120°	30	120 3
	130°	20	130 2
	140°	10	140 1
	150°	0	150 0

ANKYLOSIS TABLE

Joint ankylosed at:	0° (neutral position) 60%
	10° 53
	20° 47
	*30° 40
	40° 45
	50° 50
	60° 55
	70° 60
	80° 65
	90° 70
	100° 75
	110° 80
	120° 85
	130° 90
	140° 95
	150° (full forward elevation) 100

*position of function

SHOULDER JOINT

TECHNIC OF MEASUREMENT: Backward Elevation

Fig. 1

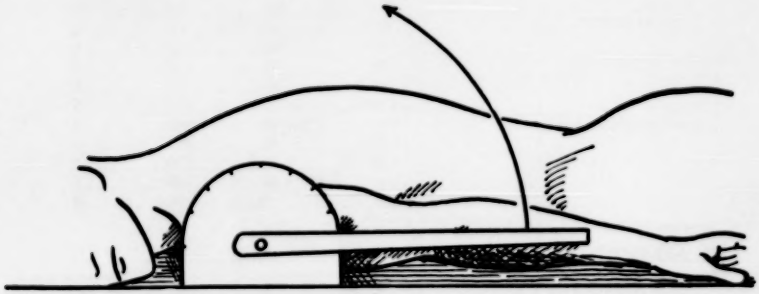

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note supination of forearm.

2. Center goniometer next to shoulder joint as shown in fig. 2. Record goniometer reading with goniometer arm along axis of upper arm.

3. With patient elevating *both* arms as far as possible as shown in fig. 1, follow range of motion with goniometer arm. Record end of arc of motion in arm to be tested.

4. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 30 degrees active backward elevation from neutral position (0°) OR any 30 degree arc of retained active backward elevation = 1% impairment of upper extremity.

5. ADD upper extremity impairment values contributed by forward elevation and backward elevation. The sum of these values is impairment of the upper extremity contributed by forward-backward elevation of shoulder.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Shoulder joint ankylosed at 10 degrees backward elevation = 70% impairment of upper extremity.

SHOULDER JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FORWARD—BACKWARD ELEVATION = 190 degrees
Value to total range of joint motion = 33%

Backward elevation from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	40	0	4%
10°	30	10	3
20°	20	20	2
30°	10	30	1
40°	0	40	0

ANKYLOSIS TABLE

Joint ankylosed at:		
	0° (neutral position)	60%
	10°	70
	20°	80
	30°	90
	40° (full backward elevation)	100

SHOULDER JOINT

TECHNIC OF MEASUREMENT: Abduction—Adduction

Fig. 1

Fig. 3

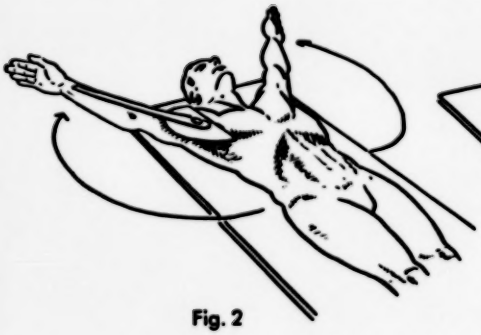

Fig. 2

Fig. 4

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note position of forearm.

2. Center goniometer over shoulder joint as shown in fig. 1. Record reading with goniometer arm along the axis of patient's arm.

3. *Abduction:* With patient abducting *both* arms as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion in arm to be tested.

4. *Adduction:* Rotate the goniometer to the position indicated in fig. 3. Starting from neutral position, with patient moving arm to be tested across abdomen as shown in fig. 4, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 20 degrees active abduction from neutral position (0°) OR any 20 degree arc of retained active abduction = 14% impairment of upper extremity.

6. ADD upper extremity impairment values contributed by abduction and adduction. The sum of these values is impairment of the upper extremity contributed by abduction and adduction of shoulder.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Shoulder joint ankylosed at 45 degrees abduction = 40% impairment of upper extremity.

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SHOULDER JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of ABDUCTION–ADDUCTION = 180 degrees
Value to total range of joint motion = 33%

	Degrees of Joint Motion			
	LOST		RETAINED	
Abduction from neutral position (0°) to:	0°	150	0	17%
	10°	140	10	16
	20°	130	20	14
	30°	120	30	13
	40°	110	40	12
	50°	100	50	11
	60°	90	60	10
	70°	80	70	9
	80°	70	80	8
	90°	60	90	7
	100°	50	100	6
	110°	40	110	4
	120°	30	120	3
	130°	20	130	2
	140°	10	140	1
	150°	0	150	0
Adduction from neutral position (0°) to:	0°	30	0	3%
	10°	20	10	2
	20°	10	20	1
	30°	0	30	0

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SHOULDER JOINT

ANKYLOSIS TABLE		IMPAIRMENT of UPPER EXTREMITY
Joint ankylosed at:	0° (neutral position)	60%
	10°	56
	20°	51
	30°	47
	40°	42
	*45°	40
	50°	43
	60°	49
	70°	54
	80°	60
	90°	66
	100°	71
	110°	77
	120°	83
	130°	89
	140°	94
	150° (full abduction)	100
Joint ankylosed at:	0° (neutral position)	60%
	10°	73
	20°	87
	30° (full adduction)	100

* position of function

SHOULDER JOINT

TECHNIC OF MEASUREMENT: Rotation

Fig. 1

Fig. 2

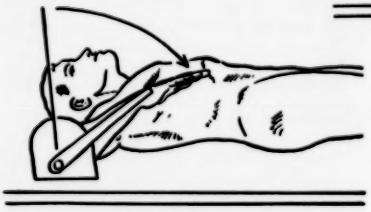

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note position of forearm.

2. Center goniometer next to elbow joint as shown in fig. 1. Record reading with goniometer arm parallel to axis of forearm. Consider 90 degrees as neutral point (0°).

3. *External rotation:* With patient attempting to touch dorsal surface of forearm to table top, as in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Internal rotation:* Starting from neutral position, with patient attempting to touch volar surface of forearm to table top, as in fig. 3, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of upper extremity.

Example: 20 degrees active external rotation from neutral position (0°) OR any 20 degree arc of retained active external rotation = 11% impairment of upper extremity.

6. ADD upper extremity impairment values contributed by external and internal rotation. The sum of these values is impairment of upper extremity contributed by rotation of shoulder.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of upper extremity.

Example: Shoulder joint ankylosed at 20 degrees external rotation = 40% impairment of upper extremity.

SHOULDER JOINT

	IMPAIRMENT of UPPER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of ROTATION = 130 degrees
Value to total joint motion = 33%

	Degrees of Joint Motion LOST	RETAINED	
Internal rotation from neutral position (0°) to:	0°	40	0	6%
	10°	30	10	5
	20°	20	20	3
	30°	10	30	2
	40°	0	40	0
External rotation from neutral position (0°) to:	0°	90	0	14%
	10°	80	10	12
	20°	70	20	11
	30°	60	30	9
	40°	50	40	8
	50°	40	50	6
	60°	30	60	5
	70°	20	70	3
	80°	10	80	2
	90°	0	90	0

ANKYLOSIS TABLE

Joint ankylosed at:	0° (neutral position)	60%
	10°	70
	20°	80
	30°	90
	40° (full int. rotation)	100

Joint ankylosed at:	0° (neutral position)	60%
	10°	50
	*20°	40
	30°	49
	40°	57
	50°	66
	60°	74
	70°	83
	80°	91
	90° (full ext. rotation)	100

* position of function

SHOULDER JOINT

When TWO or MORE RANGES OF MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of upper extremity contributed by EACH range of motion.

2. ADD impairment of upper extremity values contributed by ALL ranges of motion. The sum of these values is impairment of upper extremity contributed by SHOULDER joint.

Example—Two Ranges of Motion		IMPAIRMENT of UPPER EXTREMITY
30 degrees active FORWARD ELEVATION	=	13%
30 degrees active BACKWARD ELEVATION	=	1
20 degrees active ABDUCTION	=	14
20 degrees active ADDUCTION	=	1
(13 + 1 + 14 + 1 = 29)		29%

Example—Three Ranges of Motion		
20 degrees active INTERNAL ROTATION	=	3%
20 degrees active EXTERNAL ROTATION	=	11
FORWARD ELEVATION, BACKWARD ELEVATION, ABDUCTION, and ADDUCTION restricted as above	=	29
(3 + 11 + 29 = 43)		43%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of upper extremity contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment value is impairment of upper extremity contributed by ELBOW joint.

Example		IMPAIRMENT of UPPER EXTREMITY
Shoulder joint ankylosed at:		
60 degrees FORWARD ELEVATION	=	55%
20 degrees EXTERNAL ROTATION	=	40

The largest ankylosis impairment value is 55%, therefore, upper extremity is 55% impaired by ankylosed shoulder joint.

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UPPER EXTREMITY

When TWO or MORE UNITS are Involved

1. CALCULATE *separately* and record impairments of upper extremity contributed by EACH unit (hand, wrist joint, elbow joint, and shoulder joint).

2. COMBINE impairment values, using combined values table, to ascertain impairment of upper extremity contributed by TWO or MORE units.

		IMPAIRMENT of UPPER EXTREMITY
Example–Two Units		
Hand	=	40%
Wrist	=	30
(40 *combined* with 30 is 58)		58%
Example–Three Units		
Hand	=	40%
Wrist	=	30
Elbow	=	20
(40 *combined* with 30 is 58; 58 *combined* with 20 is 66)		66%
Example–Four Units		
Hand	=	40%
Wrist	=	30
Elbow	=	20
Shoulder	=	10
(40 *combined* with 30 is 58; 58 *combined* with 20 is 66; 66 *combined* with 10 is 69)		69%

3. CONSULT following table, to ascertain impairment of WHOLE MAN contributed by UPPER EXTREMITY.

UPPER EXTREMITY

IMPAIRMENT OF Upper Extremity	=	WHOLE MAN
0%	=	0%
1%	=	1%
2%	=	1%
3%	=	2%
4%	=	2%
5%	=	3%
6%	=	4%
7%	=	4%
8%	=	5%
9%	=	5%
10%	=	6%
11%	=	7%
12%	=	7%
13%	=	8%
14%	=	8%
15%	=	9%
16%	=	10%
17%	=	10%
18%	=	11%
19%	=	11%
20%	=	12%
21%	=	13%
22%	=	13%
23%	=	14%
24%	=	14%
25%	=	15%
26%	=	16%
27%	=	16%
28%	=	17%
29%	=	17%
30%	=	18%
31%	=	19%
32%	=	19%
33%	=	20%
34%	=	20%
35%	=	21%
36%	=	22%
37%	=	22%
38%	=	23%
39%	=	23%
40%	=	24%
41%	=	25%
42%	=	25%
43%	=	26%
44%	=	26%
45%	=	27%
46%	=	28%
47%	=	28%
48%	=	29%
49%	=	29%
50%	=	30%
51%	=	31%
52%	=	31%
53%	=	32%
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91%	=	55%
92%	=	55%
93%	=	56%
94%	=	56%
95%	=	57%
96%	=	58%
97%	=	58%
98%	=	59%
99%	=	59%
100%	=	60%

NOTE: Impairment of WHOLE MAN contributed by UPPER EXTREMITY may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

AMPUTATIONS

	IMPAIRMENT OF			
	Digit	Foot	Lower Extremity	Whole Man
Hemipelvectomy				50%
Disarticulation at hip joint			100%	40%
Amputation above knee joint with short thigh stump (3" or less below tuberosity of ischium)			100%	40%
Amputation above knee joint with functional stump			90%	36%
Disarticulation at knee joint			90%	36%
Gritti-Stokes amputation			90%	36%
Amputation below knee joint with short stump (3" or less below intercondylar notch)			90%	36%
Amputation below knee joint with functional stump			70%	28%
Amputation at ankle (Syme)		100%	70%	
Partial amputation of foot (Chopart's)		75%	53%	
Mid-metatarsal amputation		50%	35%	
Amputation of all toes At metatarsophalangeal joints		30%	21%	
Amputation of *Great Toe*				
With resection of metatarsal bone		30%		
At metatarsophalangeal joint	100%	18%		
At interphalangeal joint	75%	14%		
Amputation of *Lesser Toe* (2nd-5th)				
With resection of metatarsal bone		5%		
At metatarsophalangeal joint	100%	3%		
At proximal interphalangeal joint	80%	2%		
At distal interphalangeal joint	45%	1%		

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MULTIPLE DIGITS

All Joints	Amputated	IMPAIRMENT OF FOOT Ankylosed in		
		Full Extension	Position of Function	Full Flexion
Great	18%	14%	14%	18%
Great Second	21%	17%	16%	21%
Great Second Third	24%	20%	18%	24%
Great Second Fourth	24%	20%	18%	24%
Great Second Fifth	24%	20%	18%	24%
Great Second Third Fourth	27%	23%	20%	27%
Great Second Third Fifth	27%	23%	20%	27%
Great Second Fourth Fifth	27%	23%	20%	27%
Great Second Third Fourth Fifth	30%	26%	22%	30%
Great Third	21%	17%	16%	21%
Great Third Fourth	24%	20%	18%	24%
Great Third Fifth	24%	20%	18%	24%
Great Third Fourth Fifth	27%	23%	20%	27%
Great Fourth	21%	17%	16%	21%
Great Fourth Fifth	24%	20%	18%	24%
Great Fifth	21%	17%	16%	21%
Second	3%	3%	2%	3%
Second Third	6%	6%	4%	6%
Second Third Fourth	9%	9%	6%	9%
Second Third Fifth	9%	9%	6%	9%
Second Third Fourth Fifth	12%	12%	8%	12%
Second Fourth	6%	6%	4%	6%
Second Fourth Fifth	9%	9%	6%	9%
Second Fifth	6%	6%	4%	6%
Third	3%	3%	2%	3%
Third Fourth	6%	6%	4%	6%
Third Fourth Fifth	9%	9%	6%	9%
Third Fifth	6%	6%	4%	6%
Fourth	3%	3%	2%	3%
Fourth Fifth	6%	6%	4%	6%
Fifth	3%	3%	2%	3%

INTERPHALANGEAL JOINT of GREAT TOE

TECHNIC OF MEASUREMENT: Flexion-Extension

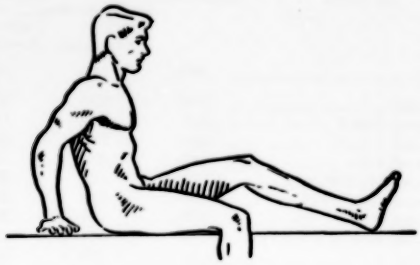

Fig. 1

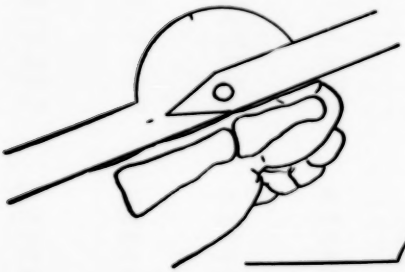

Fig. 2

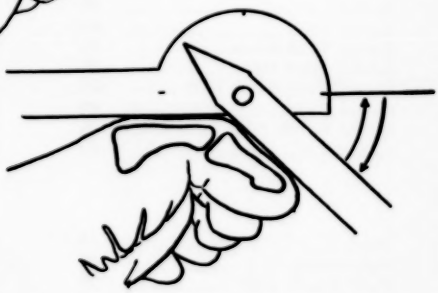

Fig. 3

Restricted Motion

1. Place patient's foot in neutral position as shown above in fig. 1. Note 45° angle of knee and 90° angle of ankle.

2. Center goniometer next to interphalangeal joint as shown in fig. 2. Record goniometer reading.

3. With patient plantar-flexing great toe as far as possible as shown in fig. 3, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of great toe.

Example: 10 degrees active flexion from neutral position OR from maximum extension = **30%** impairment of great toe.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of great toe.

Example: Interphalangeal joint ankylosed at 10 degrees flexion = **5%** impairment of great toe.

INTERPHALANGEAL JOINT of GREAT TOE

	IMPAIRMENT of GREAT TOE
AMPUTATION—At Joint	75%

RESTRICTED MOTION TABLE

Average range of FLEXION–EXTENSION = 30 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion		
	LOST	RETAINED	
Flexion from neutral position (0°) to: 0°	30	0	45%
10°	20	10	30
20°	10	20	15
30°	0	30	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	45%
	10°	55
	20°	65
	30° (full flexion)	75

*position of function

METATARSOPHALANGEAL JOINT of GREAT TOE

TECHNIC OF MEASUREMENT: Dorsi-flexion

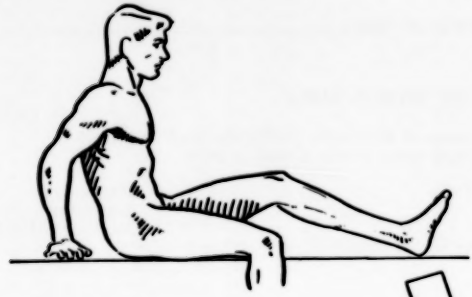

Fig. 1

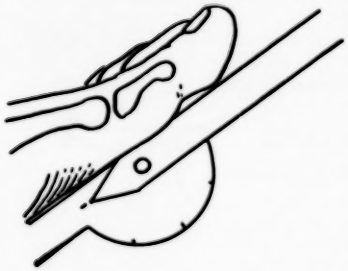

Fig. 2

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note 45° angle of knee and 90° angle of ankle.
2. Center goniometer over metatarsophalangeal joint as shown in fig. 2. Record goniometer reading.
3. With patient dorsi-flexing great toe, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of great toe.

   Example: 20 degrees active dorsi-flexion from neutral position (0°) OR any 20 degree arc of retained active dorsi-flexion = 21% impairment of great toe.
5. ADD great toe impairment values contributed by dorsi-flexion and plantar-flexion. The sum of these values is impairment of great toe contributed by metatarsophalangeal joint.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of great toe.

   Example: Metatarsophalangeal joint ankylosed at 20 degrees dorsi-flexion = 73% impairment of great toe.

METATARSOPHALANGEAL JOINT of GREAT TOE

	IMPAIRMENT of GREAT TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 80 degrees
Value to total range of joint motion = 100%

Dorsi-flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	50	0	34%
10°	40	10	28
20°	30	20	21
30°	20	30	14
40°	10	40	7
50°	0	50	0

ANKYLOSIS TABLE

Joint ankylosed at:	
*0° (neutral position)	55%
10°	64
20°	73
30°	82
40°	91
50° (full dorsi-flexion)	100

*position of function

METATARSOPHALANGEAL JOINT of GREAT TOE

TECHNIC OF MEASUREMENT: Plantar-flexion

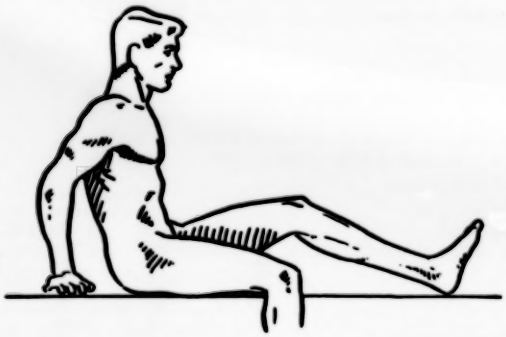

Fig. 1

Fig. 2

Fig. 3

V 1
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Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. Center goniometer over metatarsophalangeal joint as shown in fig. 2. Record goniometer reading. Note that goniometer is rotated 180° from its position for testing dorsi-flexion.

3. With patient plantar-flexing great toe as shown in fig. 3, follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of great toe.

Example: 20 degrees active plantar-flexion from neutral position (0°) OR any 20 degree arc of active plantar-flexion = 7% impairment of great toe.

5. ADD great toe impairment values contributed by dorsi-flexion and plantar-flexion. The sum of these values is impairment of great toe contributed by metatarsophalangeal joint.

Ankylosis

1. Place goniometer base as if measuring neutral position as shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of great toe.

Example: Metatarsophalangeal joint ankylosed at 20 degrees plantar-flexion = 85% impairment of great toe.

METATARSOPHALANGEAL JOINT of GREAT TOE

	IMPAIRMENT of GREAT TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 80 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion		
Plantar—flexion from neutral position (0°) to:	LOST	RETAINED	
0°	30	0	21%
10°	20	10	14
20°	10	20	7
30°	0	30	0

ANKYLOSIS TABLE

Joint ankylosed at:	
*0° (neutral position)	55%
10°	70
20°	85
30° (full plantar flexion)	100

*position of function

GREAT TOE

When BOTH JOINTS are Involved

1. **CALCULATE** *separately* and record impairment of great toe contributed by EACH joint.

2. **COMBINE** impairment values, using combined values table, to ascertain impairment of great toe contributed by BOTH joints.

		IMPAIRMENT of GREAT TOE
Example—Ankylosis		
Interphalangeal joint: ankylosed at 10 degrees flexion	=	55%
Metatarsophalangeal joint: ankylosed at 20° dorsi-flexion	=	73
(55 *combined* with 73 = 88)		88%
Example—Amputation and Restricted Motion		
Interphalangeal joint: amputated	=	75%
Metatarsophalangeal joint:		
20 degrees active dorsi-flexion from neutral position (0°); and	=	21
20 degrees active plantar-flexion from neutral position (0°)	=	7
(21 + 7 = 28; 28 *combined* with 75 = 82)		82%

3. **CONSULT** following table to ascertain impairment of FOOT contributed by GREAT TOE.

GREAT TOE

IMPAIRMENT OF Great Toe		FOOT
0%	– 2% =	0%
3%	– 8% =	1%
9%	– 13% =	2%
14%	– 19% =	3%
20%	– 24% =	4%
25%	– 30% =	5%
31%	– 35% =	6%
36%	– 41% =	7%
42%	– 46% =	8%
47%	– 52% =	9%
53%	– 57% =	10%
58%	– 62% =	11%
63%	– 68% =	12%
69%	– 73% =	13%
74%	– 79% =	14%
80%	– 84% =	15%
85%	– 90% =	16%
91%	– 95% =	17%
96%	– 100% =	18%

NOTE: Impairment of FOOT contributed by GREAT TOE may be rounded to the nearest 5% ONLY when it is the *sole* impairment involved.

DISTAL INTERPHALANGEAL JOINT of SECOND through FIFTH TOE

TECHNIC OF MEASUREMENT: Dorsi-Plantar Flexion

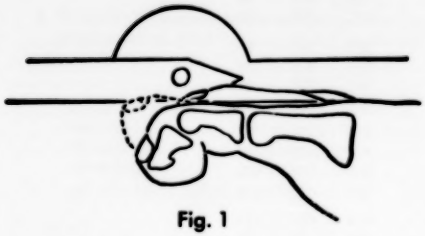

Fig. 1

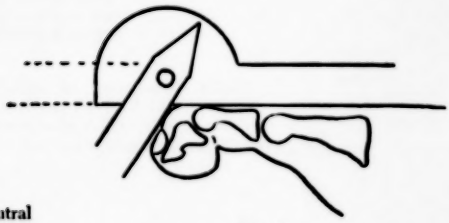

Fig. 2

Restricted Motion

1. Not measurable.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above in fig. 1. Measure deviation from neutral position with goniometer arm as shown in fig. 2. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of toe.

	IMPAIRMENT of TOE
AMPUTATION—At Joint	45%

RESTRICTED MOTION TABLE

No functional value

ANKYLOSIS TABLE

Joint ankylosed in:	Dorsi-flexion	45%
	*Neutral position	30
	Plantar-flexion (hammer toe)	45

*position of function

PROXIMAL INTERPHALANGEAL JOINT of SECOND through FIFTH TOE

TECHNIC OF MEASUREMENT: Dorsi-Plantar Flexion

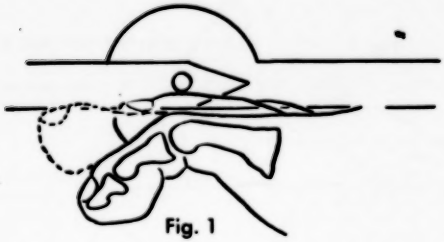

Fig. 1

Fig. 2

Restricted Motion

1. Not measurable.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above in fig. 1. Measure deviation from neutral position with goniometer arm as indicated in fig. 2. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of toe.

	IMPAIRMENT of TOE
AMPUTATION—At Joint	80%

RESTRICTED MOTION TABLE

No functional value

ANKYLOSIS TABLE

Joint ankylosed in:	Dorsi-flexion	80%
	*Neutral position	45
	Plantar-flexion	80

*position of function

METATARSOPHALANGEAL JOINT of SECOND through FIFTH TOE

TECHNIC OF MEASUREMENT: Dorsi-Plantar Flexion

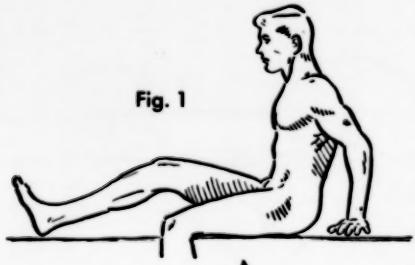

Fig. 1

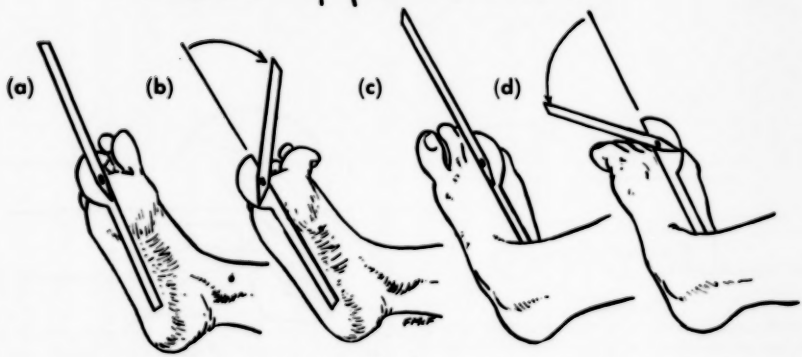

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. *Dorsi-flexion:* Center goniometer beneath metatarsophalangeal joint of toe being tested as shown in fig. 2. Record goniometer reading. With patient dorsi-flexing toe as far as possible as shown in fig. 2(b), follow range of motion with goniometer arm. Record end of arc of motion.

3. *Plantar-flexion:* Center goniometer over metatarsophalangeal joint of toe being tested as shown in fig. 2(c). Record goniometer reading. Starting from neutral position with patient plantar-flexing toe as far as possible as shown in fig. 2(d), follow range of motion with goniometer arm. Record end of arc of motion.

4. Consult appropriate Restricted Motion Table for corresponding impairment of toe.

Example: 20 degrees active dorsi-flexion from neutral position (0°) OR any 20 degree arc of retained active dorsi-flexion = 14% impairment of SECOND TOE.

5. ADD toe impairment values contributed by dorsi-flexion and plantar-flexion. The sum of these values is impairment of toe.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above in fig. 1 or 2. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult appropriate Ankylosis Table for corresponding impairment of toe.

Example: Metatarsophalangeal joint ankylosed at 20 degrees dorsi-flexion = 75% impairment of SECOND TOE.

METATARSOPHALANGEAL JOINT of SECOND TOE

	IMPAIRMENT of SECOND TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 70 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion LOST	RETAINED	
Dorsi-flexion from neutral position (0°) to:	0°	40	0	29%
	10°	30	10	21
	20°	20	20	14
	30°	10	30	7
	40°	0	40	0
Plantar-flexion from neutral position (0°) to:	0°	30	0	21%
	10°	20	10	14
	20°	10	20	7
	30°	0	30	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	50%
	10°	63
	20°	75
	30°	88
	40° (full dorsi-flexion)	100
Joint ankylosed at:	*0° (neutral position)	50%
	10°	67
	20°	83
	30° (full plantar-flexion)	100

*position of function

METATARSOPHALANGEAL JOINT of THIRD TOE

	IMPAIRMENT of THIRD TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 50 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion LOST	RETAINED	
Dorsi-flexion from neutral position (0°) to:	0°	30	0	30%
	10°	20	10	20
	20°	10	20	10
	30°	0	30	0
Plantar-flexion from neutral position (0°) to:	0°	20	0	20%
	10°	10	10	10
	20°	0	20	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	50%
	10°	67
	20°	83
	30° (full dorsi-flexion)	100
Joint ankylosed at:	*0° (neutral position)	50%
	10°	75
	20° (full plantar-flexion)	100

*position of function

METATARSOPHALANGEAL JOINT of FOURTH TOE

	IMPAIRMENT of FOURTH TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 30 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion LOST	RETAINED	
Dorsi-flexion from neutral position (0°) to:	0°	20	0 33%
	10°	10	10 17
	20°	0	20 0
Plantar-flexion from neutral position (0°) to:	0°	10	0 17%
	10°	0	10 0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	50%
	10°	75
	20° (full dorsi-flexion)	100
Joint ankylosed at:	*0° (neutral position)	50%
	10° (full plantar-flexion)	100

*position of function

METATARSOPHALANGEAL JOINT of FIFTH TOE

	IMPAIRMENT of FIFTH TOE
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 10 degrees
Value to total range of joint motion = 100%

	Degrees of Joint Motion		
	LOST	RETAINED	
Dorsi-flexion from neutral position (0°) to: 0°	10	0	50%
10°	0	10	0
Plantar-flexion from neutral position (0°) to: 0°	0	0	0%

ANKYLOSIS TABLE

Joint ankylosed at:	0° (neutral position)	50%
	10° (full dorsi-flexion)	100
joint ankylosed at:	0° (neutral position)	50%
	10° (full plantar-flexion)	100

SECOND through FIFTH TOE

When TWO or MORE JOINTS are Involved

1. CALCULATE *separately* and record impairment of toe contributed by EACH joint.

2. COMBINE impairment values, using combined values table, to ascertain impairment of toe contributed by TWO or MORE joints.

	IMPAIRMENT of TOE
Example–Two Joints	
Distal interphalangeal joint: ankylosed in neutral position (0°) =	30%
Proximal interphalangeal joint: ankylosed in neutral position (0°) =	45
(30 *combined* with 45 is 62)	62%
Example–Three Joints–Second Toe	
Distal interphalangeal joint: amputated =	45%
Proximal interphalangeal joint: ankylosed in neutral position (0°) =	45
Metatarsophalangeal joint:	
20 degrees active dorsi-flexion from neutral position (0°); and =	14
20 degrees active plantar-flexion from neutral position (0°) =	7
(14 + 7 = 21; 21 *combined* with 45 = 57; 57 *combined* with 45 = 76)	76%

3. CONSULT following table to ascertain impairment of FOOT contributed by TOE.

SECOND through FIFTH TOE

IMPAIRMENT OF	
Each Toe	FOOT
0%– 16%	0%
17 – 49	1
50 – 83	2
84 –100	3

NOTE: Impairment of FOOT contributed by TOE may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

FOOT

When TWO or MORE TOES are Involved

1. **CALCULATE** ***separately*** **and record impairment of EACH toe involved.**

2. **CALCULATE** ***separately*** **and record impairment of foot as contributed by EACH toe involved.**

3. **ADD all impairment of foot values. The sum of these values is impairment of the foot.**

Example		IMPAIRMENT of FOOT
10% of Great toe	=	2%
20% of Second toe	=	1
30% of Third toe	=	1
40% of Fourth toe	=	1
50% of Fifth toe	=	2
(2 + 1 + 1 + 1 + 2 = 7)		7%

4. **CONSULT following table to ascertain impairment of LOWER EXTREMITY as contributed by FOOT.**

FOOT

Foot		IMPAIRMENT OF LOWER EXTREMITY
0%	=	0%
1%	=	1%
2%	=	1%
3%	=	2%
4%	=	3%
5%	=	4%
6%	=	4%
7%	=	5%
8%	=	6%
9%	=	6%
10%	=	7%
11%	=	8%
12%	=	8%
13%	=	9%
14%	=	10%
15%	=	11%
16%	=	11%
17%	=	12%
18%	=	13%
19%	=	13%
20%	=	14%
21%	=	15%
22%	=	15%
23%	=	16%
24%	=	17%
25%	=	18%
26%	=	18%
27%	=	19%
28%	=	20%
29%	=	20%
30%	=	21%
31%	=	22%
32%	=	22%
33%	=	23%
34%	=	24%
35%	=	25%
36%	=	25%
37%	=	26%
38%	=	27%
39%	=	27%
40%	=	28%
41%	=	29%
42%	=	29%
43%	=	30%
44%	=	31%
45%	=	32%
46%	=	32%
47%	=	33%
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86%	=	60%
87%	=	61%
88%	=	62%
89%	=	62%
90%	=	63%
91%	=	64%
92%	=	64%
93%	=	65%
94%	=	66%
95%	=	67%
96%	=	67%
97%	=	68%
98%	=	69%
99%	=	69%
100%	=	70%

NOTE: Impairment of LOWER EXTREMITY as contributed by FOOT may be rounded to the nearest 5% ONLY when it is the *sole* impairment involved.

ANKLE JOINT

TECHNIC OF MEASUREMENT: Dorsi-Plantar Flexion

Fig. 1

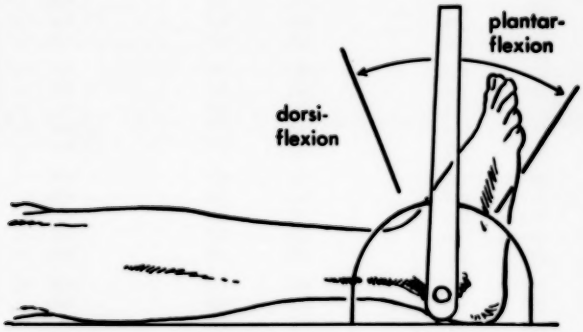

Fig. 2

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Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. Center goniometer over lateral malleolus as shown in fig. 2. Note that goniometer base lies along axis of tibia. Record goniometer reading with goniometer arm parallel to sole of foot.

3. *Dorsi-flexion:* With patient dorsi-flexing ankle as far as possible, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Plantar-flexion:* Starting from neutral position with patient plantar-flexing ankle as far as possible, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 10 degrees active dorsi-flexion from neutral position (0°) OR any 10 degree arc of retained active dorsi-flexion = 4% impairment of lower extremity.

6. ADD lower extremity impairment values contributed by dorsi-flexion and plantar-flexion. The sum of these values is impairment of lower extremity contributed by dorsi flexion and plantar flexion of ankle.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Ankle joint ankylosed at 10 degrees dorsi-flexion = 50% impairment of lower extremity.

ANKLE JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	70%

RESTRICTED MOTION TABLE

Average range of DORSI-PLANTAR FLEXION = 60 degrees
Value to total range of joint motion = 70%

	Degrees of Joint Motion		
	LOST	RETAINED	
Dorsi-flexion from neutral position (0°) to:			
0°	20	0	7%
10°	10	10	4
20°	0	20	0
Plantar-flexion from neutral position (0°) to:			
0°	40	0	14%
10°	30	10	11
20°	20	20	7
30°	10	30	4
40°	0	40	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	30%
	10°	50
	20° (full dorsi-flexion)	70
Joint ankylosed at:	*0° (neutral position)	30%
	10°	40
	20°	50
	30°	60
	40° (full plantar-flexion)	70

*position of function

ANKLE JOINT

TECHNIC OF MEASUREMENT: Inversion-Eversion

Fig. 1

Fig. 2

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 2. Note ankle is at right angle. The goniometer is not used.

2. *Inversion:* Starting from neutral position with patient inverting foot as shown in fig. 3, record range of motion as estimated by arc described by plantar surface of foot as it turns.

3. *Eversion:* With patient everting foot as shown in fig. 1, record range of motion as estimated by arc described by plantar surface of foot as it turns.

4. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 20 degrees inversion from neutral position (0°) OR any 20 degree arc of retained active inversion = 2% impairment of lower extremity.

5. ADD lower extremity impairment values contributed by inversion and eversion. The sum of these values is impairment of lower extremity contributed by inversion and eversion of ankle.

Ankylosis

1. Estimate angle at which joint is ankylosed by angle of plantar surface of foot.

2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Ankle joint ankylosed at 20 degrees inversion = 57% impairment of lower extremity.

ANKLE JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	70%

RESTRICTED MOTION TABLE

Average range of INVERSION-EVERSION = 50 degrees
Value to total range of joint motion = 30%

	Degrees of Joint Motion LOST	RETAINED	
Inversion from neutral position (0°) to:	0°	30	0 — 5%
	10°	20	10 — 4
	20°	10	20 — 2
	30°	0	30 — 0
Eversion from neutral position (0°) to:	0°	20	0 — 4%
	10°	10	10 — 2
	20°	0	20 — 0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	30%
	10°	43
	20°	57
	30° (full inversion)	70
Joint ankylosed at:	*0° (neutral position)	30%
	10°	50
	20° (full eversion)	70

*position of function

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ANKLE JOINT

When TWO RANGES of MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of lower extremity contributed by EACH range of motion.

2. ADD impairment of lower extremity values contributed by ALL ranges of motion. The sum of these values is impairment of lower extremity contributed by ANKLE joint.

Example		IMPAIRMENT of LOWER EXTREMITY
10 degrees active DORSI-FLEXION	=	4%
10 degrees active PLANTAR-FLEXION	=	11
10 degrees active INVERSION	=	4
10 degrees active EVERSION	=	2
(4 + 11 + 4 + 2 = 21)		21%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of lower extremity contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment value is the impairment of the lower extremity contributed by ANKLE joint.

Example		IMPAIRMENT of LOWER EXTREMITY
Ankle joint ankylosed at:		
10 degrees DORSI-FLEXION	=	50%
10 degrees INVERSION	=	43

The largest ankylosis impairment value is 50%, therefore, lower extremity is 50% impaired by ankylosed ankle joint.

KNEE JOINT

TECHNIC OF MEASUREMENT: Flexion-Extension

Fig. 1

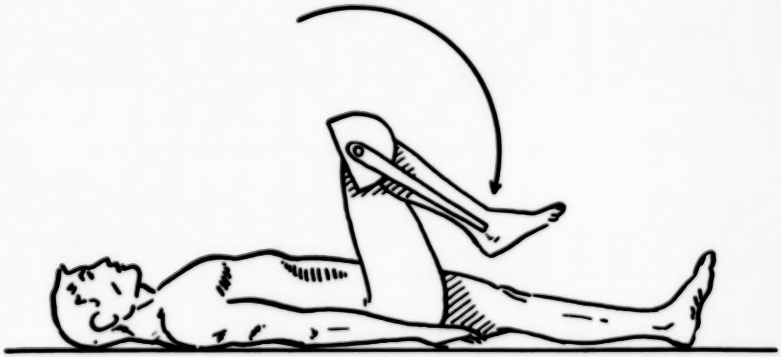

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.
2. Center goniometer next to knee joint as shown in fig. 1. Record goniometer reading with base of goniometer along axis of femur and goniometer arm along axis of lower leg. Maintain these relationships as motion is carried out.
3. With patient flexing knee as far as possible, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 20 degrees flexion from neutral position (0°) OR from maximum extension = 42% impairment of lower extremity.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Knee joint ankylosed at 20 degrees flexion = 57% impairment of lower extremity.

KNEE JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	90%

RESTRICTED MOTION TABLE

Average range of FLEXION-EXTENSION = 120 degrees
Value to total range of joint motion = 100%

Flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	120	0	50%
10°	110	10	46
20°	100	20	42
30°	90	30	38
40°	80	40	33
50°	70	50	29
60°	60	60	25
70°	50	70	21
80°	40	80	17
90°	30	90	13
100°	20	100	8
110°	10	110	4
120°	0	120	0

ANKYLOSIS TABLE

Joint ankylosed at:	
*0° (neutral position)	50%
10°	53
20°	57
30°	60
40°	63
50°	67
60°	70
70°	73
80°	77
90°	80
100°	83
110°	87
120° (full flexion)	90

*position of function

HIP JOINT

TECHNIC OF MEASUREMENT: Forward Flexion

Fig. 1

Fig. 2

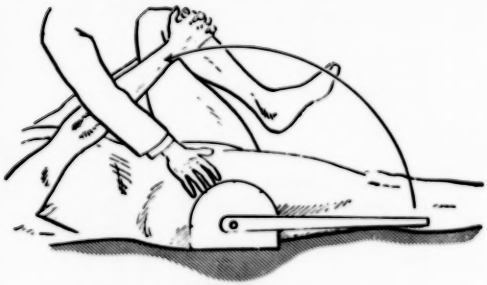

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1 with opposite hip flexed and held to lock pelvis. Leg to be tested is extended in relaxed position.

2. Place goniometer next to hip joint as shown in fig. 3. Record goniometer reading.

3. With patient flexing hip to be tested as far as possible as shown in fig. 2, follow range of motion with goniometer arm until superior iliac spine is felt to begin to move. Record end of arc of motion.

4. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 20 degrees forward flexion from neutral position (0°) OR any 20 degree arc of retained active forward flexion = 14% impairment of lower extremity.

5. ADD lower extremity impairment values contributed by forward flexion and backward extension. The sum of these values is impairment of lower extremity contributed by forward flexion and backward extension of hip.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Hip joint ankylosed at 25 degrees forward flexion = 50% impairment of lower extremity.

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HIP JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FORWARD FLEXION—BACKWARD EXTENSION = 130 degrees
Value to total range of joint motion = 33%

Forward flexion from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	100	0	18%
10°	90	10	16
20°	80	20	14
30°	70	30	12
40°	60	40	11
50°	50	50	9
60°	40	60	7
70°	30	70	5
80°	20	80	4
90°	10	90	2
100°	0	100	0

ANKYLOSIS TABLE

Joint ankylosed at:	
0° (neutral position)	70%
10°	62
20°	54
*25°	50
30°	53
40°	60
50°	67
60°	73
70°	80
80°	87
90°	93
100° (full forward flexion)	100

*position of function

HIP JOINT

TECHNIC OF MEASUREMENT: Backward Extension

Fig. 1

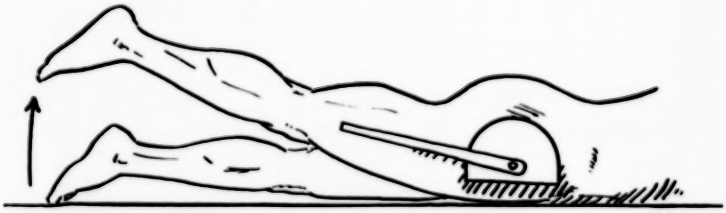

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.
2. Center goniometer next to hip joint as shown in fig. 1. Record goniometer reading.
3. With patient raising leg as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.
4. Consult Restricted Motion Table for corresponding impairment of lower extremity.

   Example: 20 degrees active backward extension from neutral position (0°) OR any 20 degree arc of retained active backward flexion = 2% impairment of lower extremity.
5. ADD lower extremity impairment values contributed by forward flexion and backward extension. The sum of these values is impairment of lower extremity contributed by forward flexion and backward extension of hip.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.
2. Consult Ankylosis Table for corresponding impairment of lower extremity.

   Example: Hip joint ankylosed at 20 degrees backward extension = 90% impairment of lower extremity.

HIP JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of FORWARD FLEXION—BACKWARD EXTENSION = 130 degrees
Value to total range of joint motion = 33%

Backward extension from neutral position (0°) to:	Degrees of Joint Motion LOST	RETAINED	
0°	30	0	5%
10°	20	10	4
20°	10	20	2
30°	0	30	0

ANKYLOSIS TABLE

Joint ankylosed at:		
0° (neutral position)		70%
10°		80
20°		90
30° (full backward ext.)		100

HIP JOINT

TECHNIC OF MEASUREMENT: Abduction—Adduction

Fig. 1

Fig. 2

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1 with opposite hip flexed and held to lock pelvis. Leg to be tested is extended in relaxed position.

2. Center goniometer over hip joint as shown in fig. 1. Record goniometer reading. Consider 90 degrees as neutral point.

3. *Abduction:* With patient abducting thigh as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Adduction:* Starting from neutral position with patient swinging leg across body as far as possible as shown in fig. 3, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 20 degrees abduction from neutral position OR any 20 degree arc of retained active abduction = 8% impairment of lower extremity.

6. ADD lower extremity impairment values contributed by abduction and adduction. The sum of these values is impairment of lower extremity contributed by abduction and adduction of hip.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Hip joint ankylosed at 20 degrees abduction = 85% impairment of lower extremity.

HIP JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	**100%**

RESTRICTED MOTION TABLE

Average range of ABDUCTION—ADDUCTION = 60 degrees
Value to total range of joint motion = 33%

	Degrees of Joint Motion		
	LOST	RETAINED	
Abduction from neutral position (0°) to:			
0°	40	0	16%
10°	30	10	12
20°	20	20	8
30°	10	30	4
40°	0	40	0
Adduction from neutral position (0°) to:			
0°	20	0	8%
10°	10	10	4
20°	0	20	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	70%
	10°	78
	20°	85
	30°	93
	40° (full abduction)	100
Joint ankylosed at:	*0° (neutral position)	30%
	10°	85
	20° (full adduction)	100

*position of function

HIP JOINT

TECHNIC OF MEASUREMENT: Rotation

Fig. 1

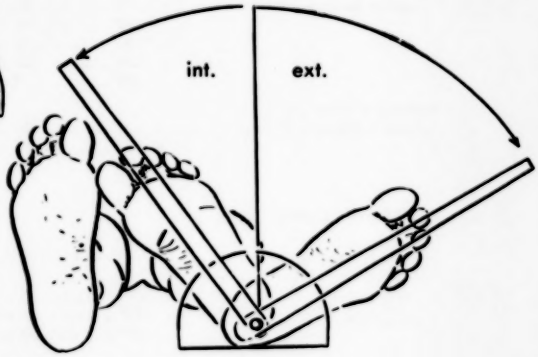

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. Center goniometer over middle of heel as shown in fig. 1. Record goniometer reading with goniometer arm lying between 2nd and 3rd toes. Consider 90 degrees as neutral point.

3 *External rotation:* With patient externally rotating hip as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Internal rotation:* Starting from neutral position with patient internally rotating hip as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of lower extremity.

Example: 20 degrees active external rotation from neutral position (0°) OR any 20 degree arc of retained active external rotation = 8% impairment of lower extremity.

6. ADD lower extremity impairment values contributed by internal and external rotation. The sum of these values is impairment of lower extremity contributed by rotation of hip.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of lower extremity.

Example: Hip joint ankylosed at 20 degrees internal rotation = 85% impairment of lower extremity.

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HIP JOINT

	IMPAIRMENT of LOWER EXTREMITY
AMPUTATION—At Joint	100%

RESTRICTED MOTION TABLE

Average range of ROTATION = 90 degrees
Value to total range of joint motion = 33%

	Degrees of Joint Motion LOST	RETAINED	
Internal rotation from neutral position (0°) to:			
0°	40	0	10%
10°	30	10	8
20°	20	20	5
30°	10	30	3
40°	0	40	0
External rotation from neutral position (0°) to:			
0°	50	0	13%
10°	40	10	10
20°	30	20	8
30°	20	30	5
40°	10	40	3
50°	0	50	0

ANKYLOSIS TABLE

Joint ankylosed at:	*0° (neutral position)	70%
	10°	78
	20°	85
	30°	93
	40° (full int. rotation)	100
Joint ankylosed at:	*0° (neutral position)	70%
	10°	76
	20°	82
	30°	88
	40°	94
	50° (full ext. rotation)	100

*position of function

HIP JOINT

When TWO or MORE RANGES of MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of lower extremity contributed by EACH range of motion.

2. ADD impairment of lower extremity values contributed by ALL ranges of motion. The sum of these values is impairment of lower extremity contributed by HIP joint.

Example—Two Ranges of Motion		IMPAIRMENT of LOWER EXTREMITY
10 degrees active FORWARD-FLEXION	=	16%
10 degrees active BACKWARD-EXTENSION	=	4
10 degrees active ABDUCTION	=	12
10 degrees active ADDUCTION	=	4
(16 + 4 + 12 + 4 = 36)		36%

Example—Three Ranges of Motion		
20 degrees active INTERNAL ROTATION	=	8%
20 degrees active EXTERNAL ROTATION	=	10
FORWARD-FLEXION, BACKWARD-EXTENSION, ABDUCTION, and ADDUCTION restricted as in above example	=	36
(8 + 10 + 36 = 54)		54%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of lower extremity contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment is impairment of lower extremity contributed by HIP joint.

Example		IMPAIRMENT of LOWER EXTREMITY
Hip joint ankylosed at:		
25 degrees FORWARD FLEXION	=	50%
20 degrees INTERNAL ROTATION	=	85

The largest ankylosis impairment value is 85%, therefore, lower extremity is 85% impaired by ankylosed hip joint.

LOWER EXTREMITY

When TWO or MORE UNITS are Involved

1. CALCULATE *separately* and record impairment of lower extremity contributed by EACH unit (foot, ankle joint, knee joint and hip joint).

2. COMBINE impairment values, using combined values table, to ascertain impairment of lower extremity contributed by TWO or MORE units.

		IMPAIRMENT of LOWER EXTREMITY
Example—Two Units		
Foot	=	40%
Ankle	=	30
(40 *combined* with 30 = 58)		58%
Example—Three Units		
Foot	=	40%
Ankle	=	30
Knee	=	20
(40 *combined* with 30 = 58; 58 *combined* with 20 = 66)		66%
Example—Four Units		
Foot	=	40%
Ankle	=	30
Knee	=	20
Hip	=	10
(40 *combined* with 30 = 58; 58 *combined* with 20 = 66; 66 *combined* with 10 = 69)		69%

3. CONSULT table on following page to ascertain impairment of WHOLE MAN contributed by LOWER EXTREMITY.

LOWER EXTREMITY

IMPAIRMENT OF Lower Extremity	=	WHOLE MAN	IMPAIRMENT OF Lower Extremity	=	WHOLE MAN	IMPAIRMENT OF Lower Extremity	=	WHOLE MAN
0%	=	0%	35%	=	14%	70%	=	28%
1%	=	0%	36%	=	14%	71%	=	28%
2%	=	1%	37%	=	15%	72%	=	29%
3%	=	1%	38%	=	15%	73%	=	29%
4%	=	2%	39%	=	16%	74%	=	30%
5%	=	2%	40%	=	16%	75%	=	30%
6%	=	2%	41%	=	16%	76%	=	30%
7%	=	3%	42%	=	17%	77%	=	31%
8%	=	3%	43%	=	17%	78%	=	31%
9%	=	4%	44%	=	18%	79%	=	32%
10%	=	4%	45%	=	18%	80%	=	32%
11%	=	4%	46%	=	18%	81%	=	32%
12%	=	5%	47%	=	19%	82%	=	33%
13%	=	5%	48%	=	19%	83%	=	33%
14%	=	6%	49%	=	20%	84%	=	34%
15%	=	6%	50%	=	20%	85%	=	34%
16%	=	6%	51%	=	20%	86%	=	34%
17%	=	7%	52%	=	21%	87%	=	35%
18%	=	7%	53%	=	21%	88%	=	35%
19%	=	8%	54%	=	22%	89%	=	36%
20%	=	8%	55%	=	22%	90%	=	36%
21%	=	8%	56%	=	22%	91%	=	36%
22%	=	9%	57%	=	23%	92%	=	37%
23%	=	9%	58%	=	23%	93%	=	37%
24%	=	10%	59%	=	24%	94%	=	38%
25%	=	10%	60%	=	24%	95%	=	38%
26%	=	10%	61%	=	24%	96%	=	38%
27%	=	11%	62%	=	25%	97%	=	39%
28%	=	11%	63%	=	25%	98%	=	39%
29%	=	12%	64%	=	26%	99%	=	40%
30%	=	12%	65%	=	26%	100%	=	40%
31%	=	12%	66%	=	26%			
32%	=	13%	67%	=	27%			
33%	=	13%	68%	=	27%			
34%	=	14%	69%	=	28%			

NOTE: In case of shortening due to overriding or malalignment or fracture deformities, but not to include flexion or extension deformities, add the following values in addition to other functional sequelae:

0 – ½ inch = 5% of lower extremity
½ – 1 inch = 10% of lower extremity
1 – 1½ inch = 15% of lower extremity
1½ – 2 inch = 20% of lower extremity

NOTE: Impairment of WHOLE MAN contributed by LOWER EXTREMITY may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

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VERTEBRAE

FRACTURES — **IMPAIRMENT of SPINE**

One Vertebra

Body of a vertebra	=	13%
Arch of a vertebra	=	3
(13 *combined* with 3 = 16)		16%

Impairment contributed by a body and an arch of a vertebra is to be COMBINED—not added.

Two or *More* Vertebrae

1. CALCULATE *separately* and record impairment of spine contributed by EACH vertebra.

2. COMBINE impairment values, using combined values table to ascertain impairment of spine contributed by TWO or MORE vertebrae.

Example—Three Vertebrae

First vertebra—		
Fractured body and arch	=	16%
Second vertebra—Fractured arch	=	3
Third vertebra—Fractured body	=	13
(16 *combined* with 3 = 19; 19 *combined* with 13 = 30)		30%

RESTRICTED MOTION

Cervical vertebrae—Evaluate impairment on basis of Restricted Motion Table for CERVICAL REGION.

Dorsal vertebrae—Evaluate impairment on basis of Restricted Motion Table for DORSOLUMBAR REGION.

Lumbar vertebrae—Evaluate impairment on basis of Restricted Motion Table for DORSOLUMBAR REGION.

VERTEBRAE

DISLOCATIONS AND SUBLUXATIONS		IMPAIRMENT of SPINE
Reduced		
One vertebra	=	16%
Two or more vertebrae		
COMBINE impairment of spine values for number of vertebrae involved.		
Example–Two vertebrae (16 *combined* with 16 = 29)	=	29
Example–Three vertebrae (16 *combined* with 16 = 29; 29 *combined* with 16 = 37)	=	37

Unreduced

Consider as temporary until reduced, then evaluate impairment on basis of reduced dislocation. If no reduction is possible, evaluate impairment on basis of restricted motion in spinal region involved.

VERTEBRAE

ANKYLOSIS

Evaluate impairment on basis of Ankylosis Table for CERVICAL or DORSO-LUMBAR REGION

OR

Favorable (neutral) Position	IMPAIRMENT of SPINE	Unfavorable Position	IMPAIRMENT of SPINE
Any 2 cervical	3%	Any 2 cervical	7%
Any 3 cervical	7	Any 3 cervical	13
Any 4 cervical	10	Any 4 cervical	20
Any 5 cervical	13	Any 5 cervical	27
Any 6 cervical	17	Any 6 cervical	33
Any 7 cervical	20	Any 7 cervical	40
C7 and D1	2	C7 and D1	4
Any 2 dorsal	1	Any 2 dorsal	2
Any 3 dorsal	2	Any 3 dorsal	4
Any 4 dorsal	3	Any 4 dorsal	5
Any 5 dorsal	4	Any 5 dorsal	7
Any 6 dorsal	5	Any 6 dorsal	9
Any 7 dorsal	5	Any 7 dorsal	11
Any 8 dorsal	6	Any 8 dorsal	13
Any 9 dorsal	7	Any 9 dorsal	15
Any 10 dorsal	8	Any 10 dorsal	16
Any 11 dorsal	9	Any 11 dorsal	18
Any 12 dorsal	10	Any 12 dorsal	20
D12 and L1	3	D12 and L1	6
Any 2 lumbar	5	Any 2 lumbar	10
Any 3 lumbar	10	Any 3 lumbar	20
Any 4 lumbar	15	Any 4 lumbar	30
Any 5 lumbar	20	Any 5 lumbar	40
C1 – C7	20	C1 – C7	40
D1 – D12	10	D1 – D12	20
L1 – L5	20	L1 – L5	40
C1 – D12	30	C1 – D12	60
D1 – L5	30	D1 – L5	60
C1 – L5	50	C1 – L5	100

CERVICAL REGION

TECHNIC OF MEASUREMENT: Flexion—Extension

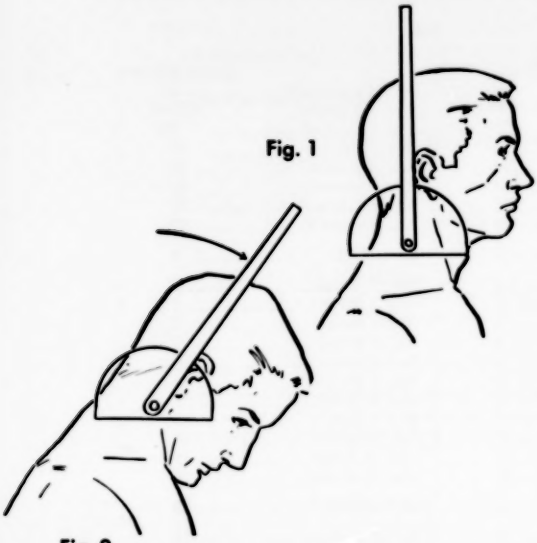

Fig. 1

Fig. 2

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. Center goniometer as shown in fig. 1, with base on line with superior border of larynx (C5) and goniometer arm along mastoid process. Record goniometer reading.

3. *Flexion:* With patient bending head as far forward as possible as shown in fig. 2, follow range of motion with goniometer arm. Keep goniometer arm along mastoid process. Record end of arc of motion.

4. *Extension:* Starting from neutral position with patient bending head as far backward as possible as shown in fig. 3, follow range of motion with goniometer arm. Again keep goniometer arm along mastoid process. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 20 degrees active flexion from neutral position (0°) OR any 20 degree arc of retained active flexion = 1% impairment of spine.

6. ADD spine impairment values contributed by flexion and extension. The sum of these values is impairment of spine contributed by flexion and extension of cervical region.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for corresponding impairment of spine.

Example: Cervical region ankylosed at 30 degrees flexion = 40% impairment of spine.

OR

1. Determine number and position of ankylosed vertebrae by appropriate x-ray methods.

2. Consult Ankylosis Table for CERVICAL VERTEBRAE for corresponding impairment of spine.

CERVICAL REGION

RESTRICTED MOTION TABLE

IMPAIRMENT of SPINE

Average range of FLEXION–EXTENSION = 60 degrees
Value to total range of cervical motion = 40%

	Degrees of Cervical Motion LOST	RETAINED	
Flexion from neutral position (0°) to:			
0°	30	0	4%
10°	20	10	3
20°	10	20	1
30°	0	30	0
Extension from neutral position (0°) to:			
0°	30	0	4%
10°	20	10	3
20°	10	20	1
30°	0	30	0

ANKYLOSIS TABLE

Region ankylosed at:		
*0° (neutral position)		20%
10°		27
20°		33
30° (full flexion)		40
Region ankylosed at:		
*0° (neutral position)		20%
10°		27
20°		33
30° (full extension)		40

*position of function

CERVICAL REGION

TECHNIC OF MEASUREMENT: Lateral Flexion

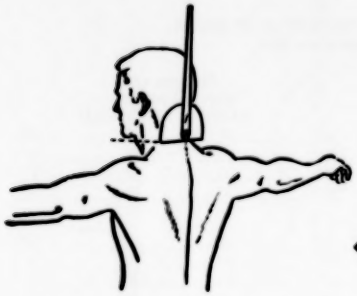

Fig. 1

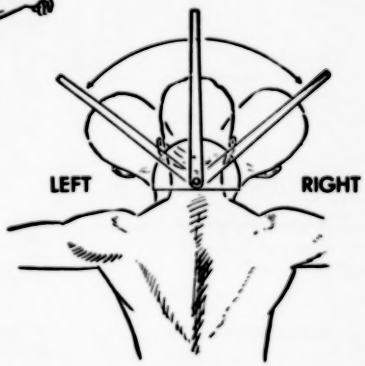

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Note lateral extension of arms to steady shoulders.

2. Center goniometer over back of neck as shown in fig. 1 with base on level with superior border of larynx and goniometer arm along midline of neck. Record goniometer reading.

3. *Left lateral flexion:* With patient bending neck to left as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Right lateral flexion:* Starting from neutral position with patient bending neck to right as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 30 degrees active left lateral flexion from neutral position (0°) OR any 30 degree arc of retained active left lateral flexion = 1% impairment of spine.

6. ADD spine impairment values contributed by left lateral flexion and right lateral flexion. The sum of these values is impairment of spine contributed by lateral flexion of cervical region.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for CERVICAL REGION for corresponding impairment of spine.

Example: Cervical region ankylosed at 20 degrees right lateral flexion = 30% impairment of spine.

OR

1. Determine number and position of ankylosed vertebrae by appropriate x-ray methods.

2. Consult Ankylosis Table for CERVICAL VERTEBRAE for corresponding impairment of spine.

CERVICAL REGION

RESTRICTED MOTION TABLE

Average range of LATERAL FLEXION = 80 degrees
Value to total range of cervical motion = 25%

	Degrees of Cervical Motion LOST	RETAINED	IMPAIRMENT of SPINE
Right lateral flexion from neutral position (0°) to:			
0°	40	0	2%
10°	30	10	2
20°	20	20	1
30°	10	30	1
40°	0	40	0
Left lateral flexion from neutral position (0°) to:			
0°	40	0	2
10°	30	10	2
20°	20	20	1
30°	10	30	1
40°	0	40	0

ANKYLOSIS TABLE

Region ankylosed at:		
	*0° (neutral position)	20%
	10°	25
	20°	30
	30°	35
	40° (full right lat. flexion)	40
Region ankylosed at:		
	*0° (neutral position)	20%
	10°	25
	20°	30
	30°	35
	40° (full left lat. flexion)	40

*position of function

CERVICAL REGION

TECHNIC OF MEASUREMENT: Rotation

Fig. 1

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1, with examiner preventing motion of shoulders. The goniometer is not used.

2. With patient rotating head to right and left as far as possible as shown in fig. 2, record range of motion in each direction *separately* as estimated by arc described by chin as it turns from neutral position.

3. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 20 degrees active left rotation from neutral position (0°) OR any 20 degree arc of retained active left rotation = 1% impairment of spine.

4. ADD spine impairment values contributed by left rotation and right rotation. The sum of these values is impairment of spine contributed by rotation of cervical region.

Ankylosis

1. Estimate and record angle at which cervical region is ankylosed by position of chin.

2. Consult Ankylosis Table for CERVICAL REGION for corresponding impairment of spine.

Example: Cervical region ankylosed at 20 degrees right rotation = 3% impairment of spine.

OR

1. Determine number and position of ankylosed VERTEBRAE by appropriate x-ray methods.

2. Consult Ankylosis Table for CERVICAL VERTEBRAE for corresponding impairment of spine.

CERVICAL REGION

RESTRICTED MOTION TABLE

IMPAIRMENT of SPINE

Average range of ROTATION = 60 degrees
Value to total range of cervical motion = 35%

	Degrees of Cervical Motion LOST	RETAINED	
Right rotation from neutral position (0°) to:	0°	30	0 — 4%
	10°	20	10 — 2
	20°	10	20 — 1
	30°	0	30 — 0
Left rotation from neutral position (0°) to:	0°	30	0 — 4%
	10°	20	10 — 2
	20°	10	20 — 1
	30°	0	30 — 0

ANKYLOSIS TABLE

Region ankylosed at:	*0° (neutral position)	20%
	10°	27
	20°	33
	30° (full right rotation)	40
Region ankylosed at:	*0° (neutral position)	20%
	10°	27
	20°	33
	30° (full left rotation)	40

*position of function

DORSOLUMBAR REGION

TECHNIC OF MEASUREMENT: Flexion—Extension

Fig. 1

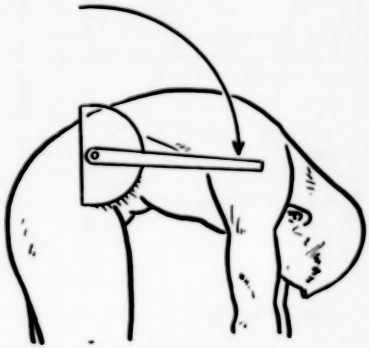

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1. Arm is raised in figure merely to show placement of goniometer.

2. Center goniometer along mid-axillary line at level of lowest rib as shown in fig. 1. Record goniometer reading.

3. *Flexion:* With patient bending as far forward as possible as shown in fig. 2, follow range of motion, keeping goniometer arm along mid-axillary line. Note goniometer base is to be kept in line with femur. Record end of arc of motion.

4. *Extension:* Starting from neutral position with patient bending as far backward as possible, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 20 degrees active flexion from neutral position (0°) OR any 20 degree arc of retained active flexion = 7% impairment of spine.

6. ADD spine impairment values contributed by flexion and extension. The sum of these values is impairment of spine contributed by flexion and extension of dorsolumbar region.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for DORSOLUMBAR REGION for corresponding impairment of spine.

Example: Dorsolumbar region ankylosed at 20 degrees flexion = 37% impairment of spine.

OR

1. Determine number and position of ankylosed VERTEBRAE by appropriate x-ray methods.

2. Consult appropriate Ankylosis Table for VERTEBRAE for corresponding impairment of spine.

DORSOLUMBAR REGION

RESTRICTED MOTION TABLE

Average range of FLEXION–EXTENSION = 120 degrees
Value to total range of dorsolumbar motion = 40%

	Degrees of Dorsolumbar Motion LOST	RETAINED	IMPAIRMENT of SPINE
Flexion from neutral position (0°) to:			
0°	90	0	9%
10°	80	10	8
20°	70	20	7
30°	60	30	6
40°	50	40	5
50°	40	50	4
60°	30	60	3
70°	20	70	2
80°	10	80	1
90°	0	90	0
Extension from neutral position (0°) to:			
0°	30	0	3%
10°	20	10	2
20°	10	20	1
30°	0	30	0

ANKYLOSIS TABLE

Region ankylosed at:		
	*0° (neutral position)	30%
	10°	33
	20°	37
	30°	40
	40°	43
	50°	47
	60°	50
	70°	53
	80°	57
	90° (full flexion)	60

Region ankylosed at:		
	*0° (neutral position)	30%
	10°	40
	20°	50
	30° (full extension)	60

*position of function

DORSOLUMBAR REGION

TECHNIC OF MEASUREMENT: Lateral Flexion

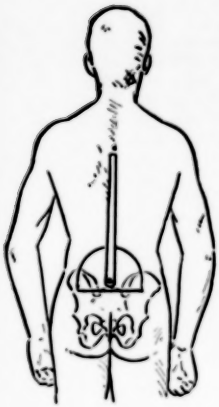

Fig. 1

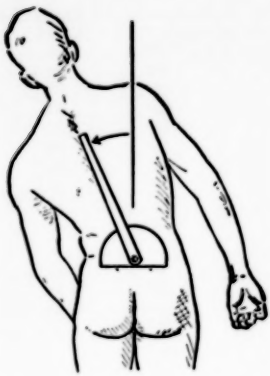

Fig. 2

Fig. 3

Restricted Motion

1. Place patient in neutral position as shown in fig. 1.

2. Center goniometer as shown in fig. 1 with base over posterior superior iliac spines and goniometer arm along midline of back. Record goniometer reading.

3. *Left lateral flexion:* With patient bending to left as far as possible as shown in fig. 2, follow range of motion with goniometer arm. Record end of arc of motion.

4. *Right lateral flexion:* Starting from neutral position with patient bending to right as far as possible as shown in fig. 3, follow range of motion with goniometer arm. Record end of arc of motion.

5. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 10 degrees active left lateral flexion from neutral position (0°) OR any 10 degree arc of retained left lateral flexion = 2% impairment of spine.

6. ADD spine impairment values as contributed by left lateral flexion and right lateral flexion. The sum of these values is impairment of spine contributed by lateral flexion of dorsolumbar region.

Ankylosis

1. Place goniometer base as if measuring neutral position shown above. Measure deviation from neutral position with goniometer arm. Record goniometer reading.

2. Consult Ankylosis Table for DORSOLUMBAR REGION for corresponding impairment of spine.

Example: Dorsolumbar region ankylosed at 10 degrees right lateral flexion = 45% impairment of spine.

OR

1. Determine number and position of ankylosed VERTEBRAE by appropriate x-ray methods.

2. Consult appropriate Ankylosis Table for VERTEBRAE for corresponding impairment of spine.

DORSOLUMBAR REGION

RESTRICTED MOTION TABLE

IMPAIRMENT of SPINE

Average range of LATERAL FLEXION = 40 degrees
Value to total range of dorsolumbar motion = 25%

	Degrees of Dorsolumbar Motion LOST	RETAINED	IMPAIRMENT of SPINE
Right lateral flexion from neutral position (0°) to:	0°	20	0	4%
	10°	10	10	2
	20°	0	20	0
Left lateral flexion from neutral position (0°) to:	0°	20	0	4%
	10°	10	10	2
	20°	0	20	0

ANKYLOSIS TABLE

Region ankylosed at:	*0° (neutral position)	30%
	10°	45
	20° (full right lat. flex.)	60
Region ankylosed at:	*0° (neutral position)	30%
	10°	45
	20° (full left lat. flex.)	60

*position of function

DORSOLUMBAR REGION

TECHNIC OF MEASUREMENT: Rotation

Fig. 1

Fig. 2

Restricted Motion

1. Place patient in neutral position as shown in fig. 1, with examiner preventing motion of pelvis. The goniometer is not used.

2. With patient twisting to right and left as far as possible as shown in fig. 2, record range of motion in each direction *separately* as estimated by arc described by frontal plane of body as it turns from neutral position.

3. Consult Restricted Motion Table for corresponding impairment of spine.

Example: 10 degrees active left rotation from neutral position (0°) OR any 10 degree arc of retained active left rotation = 4% impairment of spine.

4. ADD spine impairment values contributed by left rotation and right rotation. The sum of these values is impairment of spine contributed by rotation of dorsolumbar region.

Ankylosis

1. Estimate and record angle at which dorsolumbar region is ankylosed by position of frontal plane of body.

2. Consult Ankylosis Table for DORSOLUMBAR REGION for corresponding impairment of spine.

Example: Dorsolumbar region ankylosed at 10 degrees right rotation = 40% impairment of spine.

OR

1. Determine number and position of ankylosed VERTEBRAE by appropriate x-ray methods.

2. Consult appropriate Ankylosis Table for VERTEBRAE for corresponding impairment of spine.

DORSOLUMBAR REGION

RESTRICTED MOTION TABLE

IMPAIRMENT of SPINE

Average range of ROTATION = 60 degrees
Value to total range of dorsolumbar motion = 35%

	Degrees of Dorsolumbar Motion LOST	RETAINED	
Right rotation from neutral position (0°) to:			
	0°	30	0 — 5%
	10°	20	10 — 4
	20°	10	20 — 2
	30°	0	30 — 0
Left rotation from neutral position (0°) to:			
	0°	30	0 — 5%
	10°	20	10 — 4
	20°	10	20 — 2
	30°	0	30 — 0

ANKYLOSIS TABLE

Region ankylosed at:	*0° (neutral position)	30%
	10°	40
	20°	50
	30° (full right rotation)	60
Region ankylosed at:	*0° (neutral position)	30%
	10°	40
	20°	50
	30° (full left rotation)	60

*position of function

SPINAL REGION

When TWO or MORE RANGES of MOTION are Involved

RESTRICTED MOTION

1. CALCULATE *separately* and record impairment of spine as contributed by EACH range of motion.

2. ADD impairment of spine values contributed by ALL ranges of motion. The sum of these values is impairment of spine contributed by SPINAL REGION.

Example–Two Ranges of Motion in Cervical Region		IMPAIRMENT of SPINE
20 degrees active FLEXION	=	1%
20 degrees active EXTENSION	=	1
20 degrees active RIGHT ROTATION	=	1
20 degrees active LEFT ROTATION	=	1
(1 + 1 + 1 + 1 = 4)		4%

Example–Three Ranges of Motion in Cervical Region		
20 degrees active RIGHT LATERAL FLEXION	=	1%
20 degrees active LEFT LATERAL FLEXION	=	1
FLEXION, EXTENSION, RIGHT and LEFT ROTATION restricted as above	=	4
(1 + 1 + 4 = 6)		6%

ANKYLOSIS

1. CALCULATE *separately* and record impairment of spine contributed by ankylosis in EACH position.

2. The *largest* ankylosis impairment value is the impairment of spine contributed by SPINAL REGION.

Example–Cervical Region ankylosed at:		IMPAIRMENT of SPINE
20 degrees FLEXION	=	33%
10 degrees RIGHT ROTATION	=	27

The largest ankylosis impairment value is 33%, therefore, spine is 33% impaired by ankylosed cervical region.

SPINE

IMPAIRMENT OF Spine		IMPAIRMENT OF WHOLE MAN
0%	=	0%
1%	=	1%
2%	=	1%
3%	=	2%
4%	=	2%
5%	=	3%
6%	=	4%
7%	=	4%
8%	=	5%
9%	=	5%
10%	=	6%
11%	=	7%
12%	=	7%
13%	=	8%
14%	=	8%
15%	=	9%
16%	=	10%
17%	=	10%
18%	=	11%
19%	=	11%
20%	=	12%
21%	=	13%
22%	=	13%
23%	=	14%
24%	=	14%
25%	=	15%
26%	=	16%
27%	=	16%
28%	=	17%
29%	=	17%
30%	=	18%
31%	=	19%
32%	=	19%
33%	=	20%
34%	=	20%

IMPAIRMENT OF Spine		IMPAIRMENT OF WHOLE MAN
35%	=	21%
36%	=	22%
37%	=	22%
38%	=	23%
39%	=	23%
40%	=	24%
41%	=	25%
42%	=	25%
43%	=	26%
44%	=	26%
45%	=	27%
46%	=	28%
47%	=	28%
48%	=	29%
49%	=	29%
50%	=	30%
51%	=	31%
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58%	=	35%
59%	=	35%
60%	=	36%
61%	=	37%
62%	=	37%
63%	=	38%
64%	=	38%
65%	=	39%
66%	=	40%
67%	=	40%
68%	=	41%
69%	=	41%

IMPAIRMENT OF Spine		IMPAIRMENT OF WHOLE MAN
70%	=	42%
71%	=	43%
72%	=	43%
73%	=	44%
74%	=	44%
75%	=	45%
76%	=	46%
77%	=	46%
78%	=	47%
79%	=	47%
80%	=	48%
81%	=	49%
82%	=	49%
83%	=	50%
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89%	=	53%
90%	=	54%
91%	=	55%
92%	=	55%
93%	=	56%
94%	=	56%
95%	=	57%
96%	=	58%
97%	=	58%
98%	=	59%
99%	=	59%
100%	=	60%

NOTE: Impairment of WHOLE MAN contributed by SPINE may be rounded to the nearest 5 percent ONLY when it is the *sole* impairment involved.

OTHER CONDITIONS

INTERVERTEBRAL DISC LESIONS	IMPAIRMENT of WHOLE MAN
1. Non-operated, clinically established disc derangement WITHOUT RESIDUALS	5%
2. Operated, disc removed, WITHOUT RESIDUALS	5
3. Operated or non-operated, clinically established disc derangement WITH RESIDUALS (Basic Value)	5

Residuals are to be evaluated on the basis of:

(a) Ankylosis (fusion) in spinal area or extremities; or
(b) Restricted motion in spinal area or extremities; or
(c) Fractures of vertebrae; or
(d) Any combination thereof.

Individual impairment values from any of the above factors are to be reduced to the common denominator of the whole man, and then combined with the basic value (5%) to achieve the final evaluation in these cases.

SPINAL CORD INJURY	
1. Partial paraplegia, able to walk without braces, complete bowel and bladder control	60%
2. Partial paraplegia, partial bowel and bladder control, but able to walk without braces	80
3. Total paraplegia, total bowel and bladder involvement	100
4. Quadriplegia	100

PELVIS

	IMPAIRMENT of WHOLE MAN
1. Fractures without displacement, *healed*, WITHOUT RESIDUALS	0%
2. Fractures with displacement, *healed*, WITHOUT RESIDUALS	
a. Single ramus	0
b. Rami, bilateral	0
c. Ilium	0
d. Innominate	0
e. Symphysis pubis, without separation	5
f. Sacrum	5
g. Coccyx	0
3. Fractures with displacement, *healed*, WITH DEFORMITY and RESIDUALS	
a. Single ramus	0
b. Rami, bilateral	5
c. Ilium	2
d. Innominate, displaced 1 inch or more	10
e. Symphysis pubis, displaced or separated	15
f. Sacrum, into sacro-iliac joint	10
g. Coccyx, non-union or excision	5
h. Fracture into acetabulum	
Evaluate on basis of restricted motion of hip joint	

SPINE

When TWO or MORE CONDITIONS are Involved

1. **CALCULATE** *separately* and record impairment of spine contributed by **EACH** condition.

2. **COMBINE** impairment values, using combined values table, to ascertain impairment of spine contributed by **TWO** or **MORE** conditions.

3. Using the table on page 103, **CONVERT** combined impairments of spine to impairments of whole man.

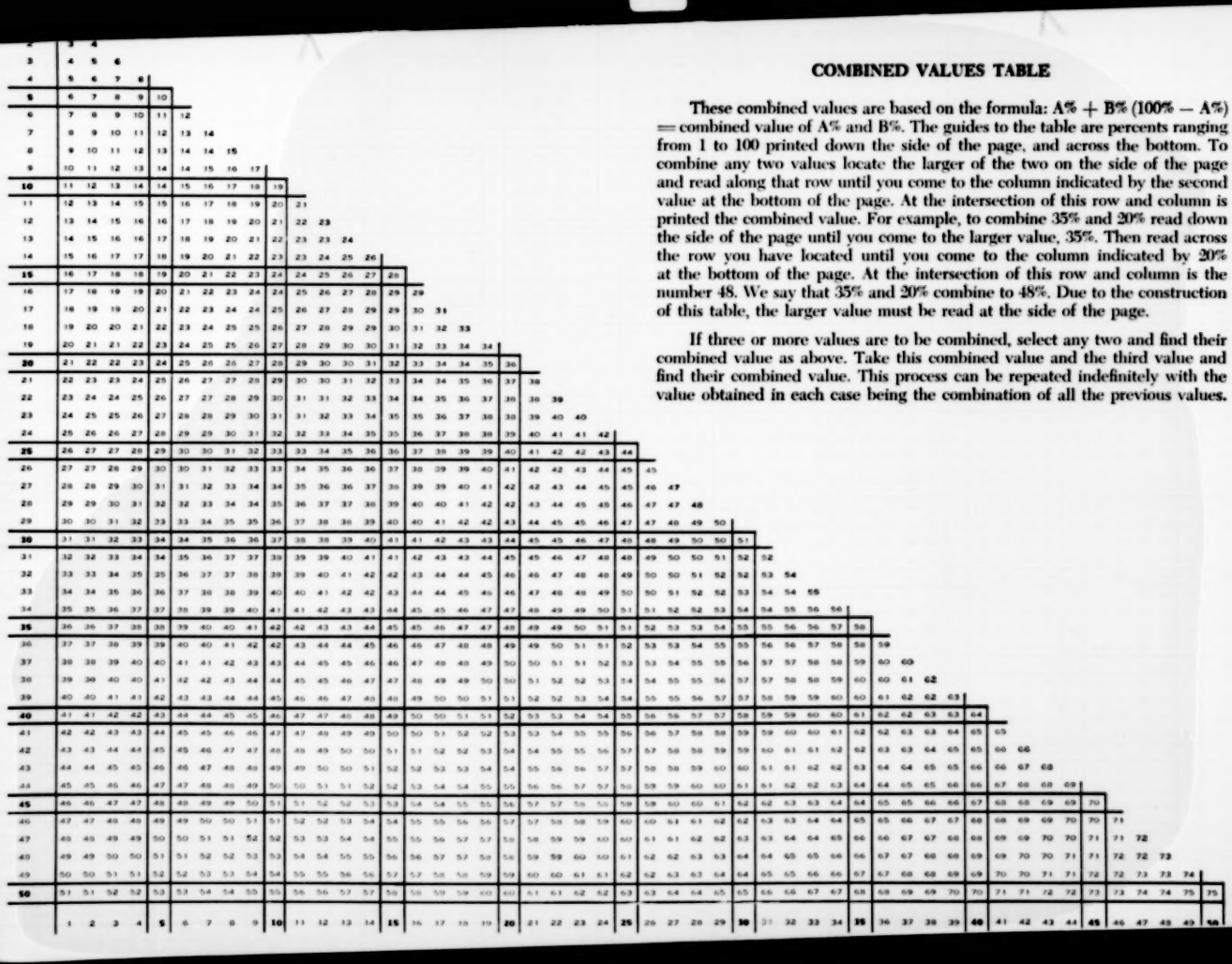
4. **COMBINE** impairment of whole man values, using combined values table, to ascertain final evaluation.

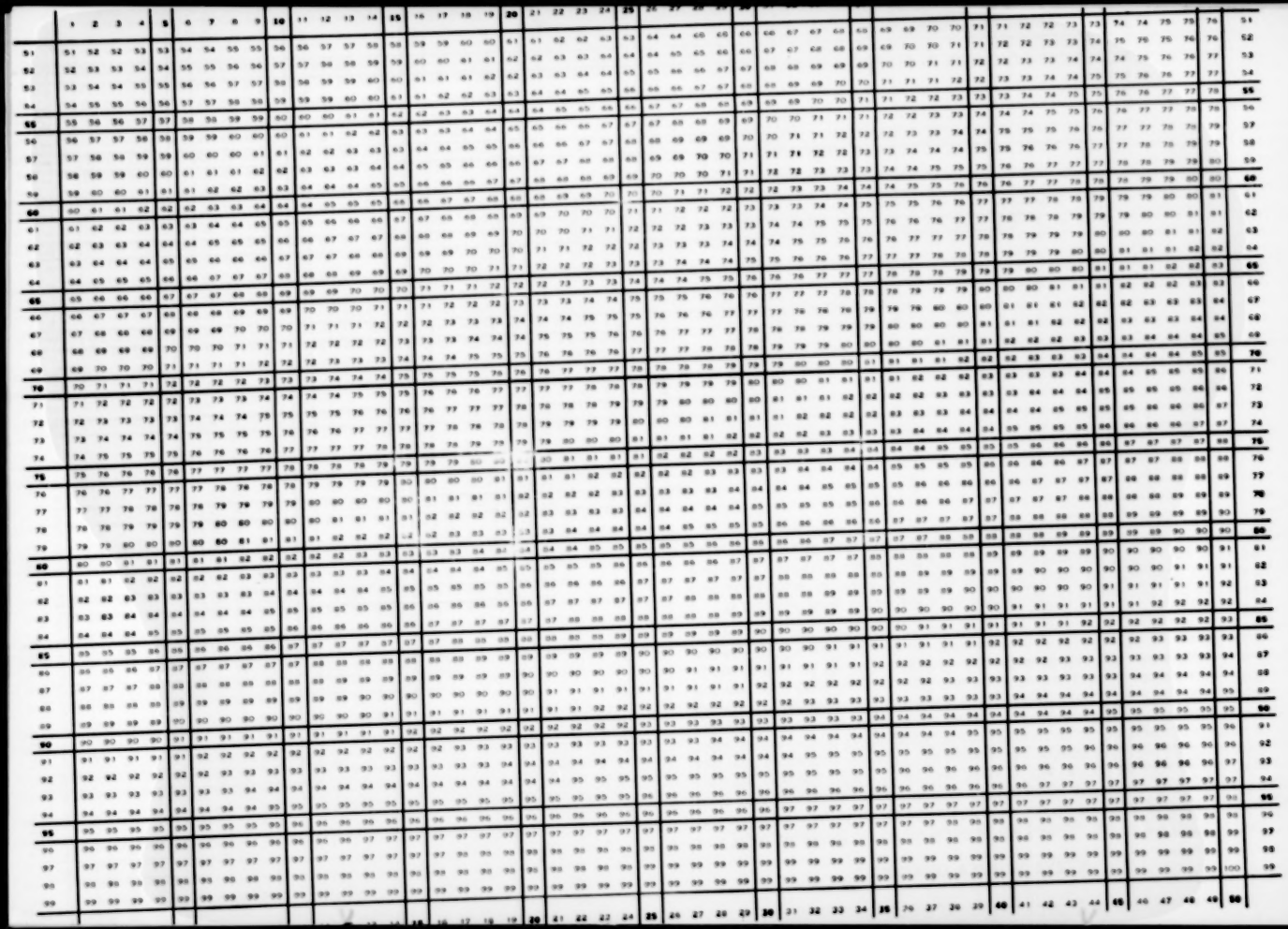
	IMPAIRMENT of SPINE	IMPAIRMENT of WHOLE MAN
Example—Back case involving multiple conditions		
L1—fracture of body and arch	16%	
L2—fracture of body	13	
D12 through L3 ankylosed in favorable position	13	
Cervical region—motion restricted to:		
20 degrees flexion = 1		
20 degrees extension = 1		
30 degrees right lateral flexion = 1		
30 degrees left lateral flexion = 1		
10 degrees right rotation = 2		
10 degrees left rotation = 2		
8	8	
(16 *combined* with 13 = 27; 27 *combined* with 13 = 36; 36 *combined* with 8 = 41)	41%	25%
Non-operated cervical disc derangement without residuals		5
(25 *combined* with 5 = 29)		29%

COMBINED VALUES TABLE

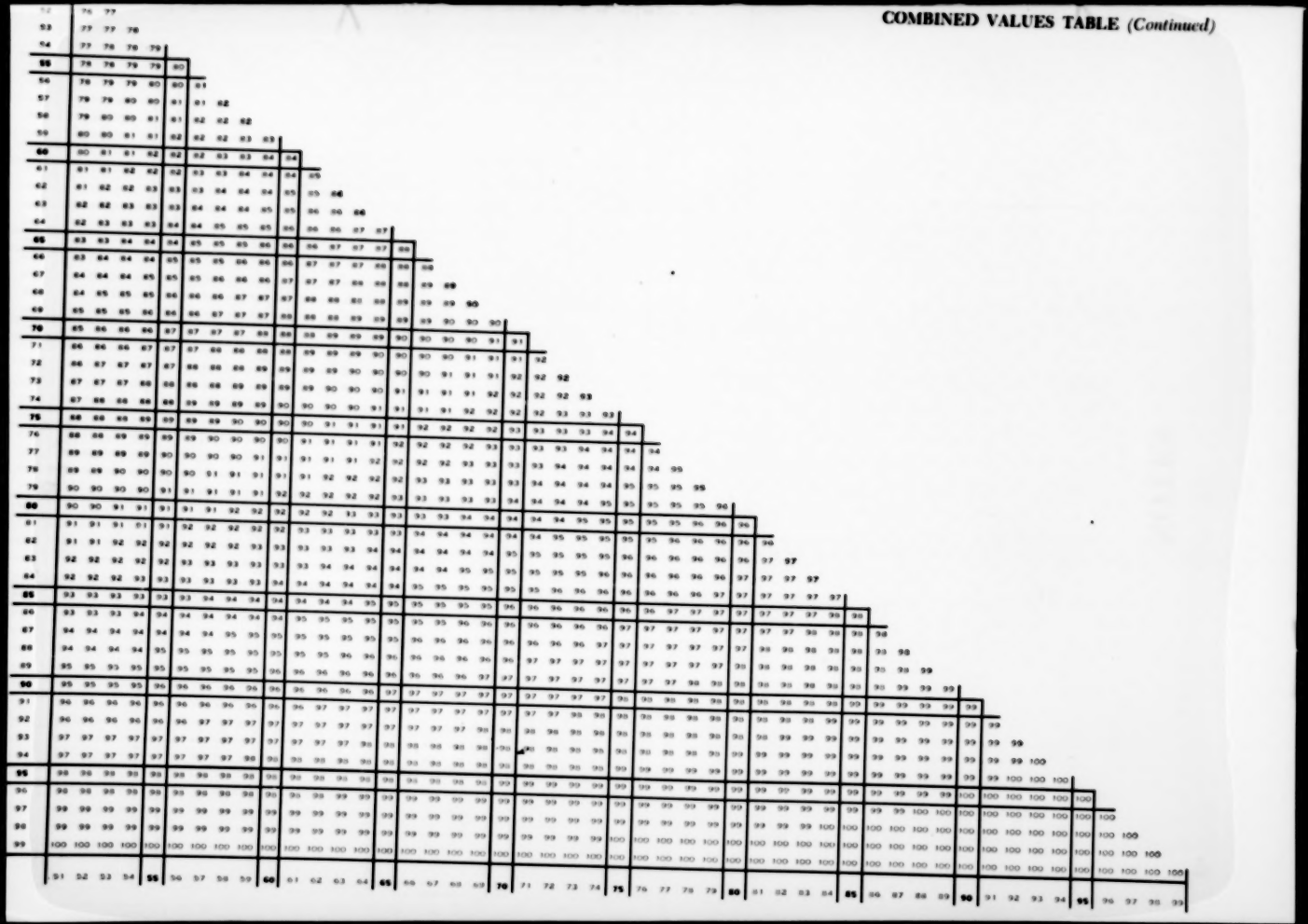
These combined values are based on the formula: A% + B% (100% − A%) = combined value of A% and B%. The guides to the table are percents ranging from 1 to 100 printed down the side of the page, and across the bottom. To combine any two values locate the larger of the two on the side of the page and read along that row until you come to the column indicated by the second value at the bottom of the page. At the intersection of this row and column is printed the combined value. For example, to combine 35% and 20% read down the side of the page until you come to the larger value, 35%. Then read across the row you have located until you come to the column indicated by 20% at the bottom of the page. At the intersection of this row and column is the number 48. We say that 35% and 20% combine to 48%. Due to the construction of this table, the larger value must be read at the side of the page.

If three or more values are to be combined, select any two and find their combined value as above. Take this combined value and the third value and find their combined value. This process can be repeated indefinitely with the value obtained in each case being the combination of all the previous values.





COMBINED VALUES TABLE *(Continued)*



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